



**BACK ON PATROL**  
**UK TO RESTORE**  
**MARITIME PRIDE**  
**WITH P-8 ORDER**  
**REPORT P6**

**IN RECOVERY**

Bombardier reveals new five-year financial plan, with CSeries introduction the key for success **8**

**LOCAL HEROES**

We weigh up aviation's regional rivals in second instalment of our World Airliner directory **26**

# FLIGHT INTERNATIONAL

From  Flightglobal

1-7 DECEMBER 2015



**CERTIFICATION**

## TRANSFER OF POWER

Toulouse ready for ramp-up after re-engined A320 gets green light

£3.50



9 770015371273

4 9 >



# EXPERIENCE THE FUTURE OF FLIGHT

Be there as aviation accelerates into the future at the Singapore Airshow 2016. Seize this opportunity to network, discover, exchange ideas and invest in the industry among the region's top government and defence delegations, as well as the world's aviation giants. Register your attendance today.

## SHOW HIGHLIGHTS

- 2016 Feature Country: France
- Aerospace Emerging Technologies Zone
- Business Aviation Zone
- Training and Simulation Zone
- Singapore Airshow Aviation Leadership Summit 2016
- Asia Pacific Security Conference 2016
- Business Forums

SCAN TO REGISTER NOW



## TRADE VISITOR PROMOTION!

Stand a chance to win in our **Pre-Registration Lucky Draw\*** and enjoy the Early Bird rates when you register as a trade visitor by 30 Nov 2015! \*Terms and Conditions apply

Visit [www.singaporeairshow.com/register](http://www.singaporeairshow.com/register) to find out more!

FOLLOW US:



# SINGAPORE AIRSHOW 2016 ASIA'S BIGGEST FOR AVIATION'S FINEST

CHANGI EXHIBITION CENTRE  
16 - 21 FEBRUARY

Organised by:



Official Media Partner:



Supporting Publications:



Endorsed by:



Held in:



**COVER IMAGE**

Airbus released this image of an A320neo powered by Pratt & Whitney PW1100G engines as the new model secured European and US type certification **P7**

**BEHIND THE HEADLINES**

**Dominic Perry** travelled to **Brasov** in **Romania** – close to Dracula's castle – to hear **Airbus Helicopters'** plans to revive aircraft production in the country, as well as giving its legacy Super Puma rotorcraft, now renamed as the **H215**, more bite (**P25**)

**NEXT WEEK AIR FORCES**

Our annual World Air Forces directory details the more than 52,000 military aircraft in service around the globe

**NEWS****THIS WEEK**

- 6** P-8 buy will close UK capability gap
- 8** Bombardier walks financial tightrope
- 9** Brownout caused V-22 stall.
- Blue Origin lands New Shepard rocket

**AIR TRANSPORT**

- 10** UK interiors firm aims high as China's AVIC snaps it up.
- Russian order helps Boeing with white-tail backlog.
- Zodiac reveals €6.1m cost of seating crisis
- 11** Finnair leases 777 to cover for A350.
- A330-based Beluga XL starts to take shape as fuselage machining begins.
- Wiring change boosts A320's taxi efficiency
- 12** R-R brings competition to Trent MRO.
- PAL planning wet-lease of underutilised A330s.
- Q400 gear 'retracted too early'
- 13** Eurocontrol sharpens 'blunt' wake-turbulence categories.
- Air Berlin Technik maintains plans for Munich site

**NEWS FOCUS**

- 14** Typhoon and Lightning II gain strength from SDSR
- 19** Osprey takes fresh tilt at CSAR role
- 25** Airbus spins up a Romanian revival

**DEFENCE**

- 16** JASSM-ER update to safeguard B-52.
- Tokyo gets approval for Global Hawk purchase
- 17** Spain plans to arm Reapers.
- Upgraded E-3G makes combat debut for USAF

**BUSINESS AVIATION**

- 20** Gulfstream boosts G500 fleet to three.
- Caravan engine upgrade approved for Blackhawk.
- Nextant given the green light for G90XT deliveries
- 21** Wheels Up trains its sights on Europe.
- Medevac missions for Dassault demonstrator.
- Legacy 500 angles in on steep-approach approval



Airbus to reanimate Romanian rotorcraft industry **P25**

**COVER STORY**

- 7** **Green light for first of Neo generation**
- Certification of PW1100G-powered variant of re-engined narrowbody paves the way for several deliveries before year-end

**FEATURES**

- 26** **WORLD AIRLINER DIRECTORY Regional rivals**
- In the second part of our annual overview, we review the industry's regional projects. Three manufacturers retain a stranglehold on the market for aircraft with fewer than 100 seats, but new arrivals, including the MRJ, could change that

**REGULARS**

- 5** **Comment**
- 35** **Straight & Level**
- 36** **Letters**
- 38** **Classified**
- 40** **Jobs**
- 43** **Working Week**



Bell seeks orders on back of Osprey's CSAR success **P19**. Eurocontrol refines wake-vortex classification **P13**



US Air Force, AirTeamImages

**Download the latest Commercial Engines Report**  
now with further enhanced data and in-depth market analysis

[flightglobal.com/commengines](http://flightglobal.com/commengines)



The Power of Flight

**IMAGE OF THE WEEK**

**Etiad has celebrated the arrival of its new Airbus A380 service at New York's John F Kennedy International airport. This included a debut of the carrier's exclusive service including 'The Residence'; a three-room suite with a butler. Etiad now operates two flights per day between Abu Dhabi and New York**

View more great aviation shots online and in our weekly tablet edition:



[flightglobal.com/  
flight-international](http://flightglobal.com/flight-international)



Etihad Airways

**THE WEEK IN NUMBERS**

**45%**

Zodiac Aerospace Group

Operating profit for the year to end-August fell to €314m at Zodiac Aerospace, as a result of its seat production crisis

**\$13m**

AeroVironment

Value of US Marine Corps order for AeroVironment RQ-20A Puma AE reconnaissance UAVs, for delivery in 12 months

**200km**

Airbus Defence & Space

Length of the cycle road race at the 2016 Rio Olympics; Airbus Defence & Space will provide airborne radio links

**QUESTION OF THE WEEK**

Last week, we asked: **With Flexjet's AS2 order, supersonic business travel is:** You said:

**71%**

Just a marketing fantasy

**23%**

Still many years from viability

**TOTAL VOTES:  
1,320**

**6%**

On a sure path to take-off

This week, we ask: **With the RAF to get new maritime patrol aircraft:  P-8 is the right choice  Another nautical disaster looms  A UK solution would be better**

**Vote at [flightglobal.com](http://flightglobal.com)**



Flightglobal's premium news and data service delivers breaking air transport stories with profiles, schedules, and fleet, financial and traffic information [flightglobal.com/dashboard](http://flightglobal.com/dashboard)



CAE offers training centres, training services, and simulation products for helicopters.

Download the Military Simulator Census online now.

[www.flightglobal.com/milisim](http://www.flightglobal.com/milisim)



# Second time lucky?

The UK's hotly-anticipated Strategic Defence and Security Review brought good news at last for the nation's military – but much of the content remedies mistakes made back in 2010

**L**ife experience tells us that after making a mistake, it takes guts, humility – or both even – to recognise it and put things right.

Of course, that's not how UK Prime Minister David Cameron's government would view the results of the long-awaited Strategic Defence and Security Review (SDSR), released on 23 November.

Five years after it faced stinging criticism for scrapping the Royal Air Force's incoming Nimrod MRA4 maritime patrol aircraft (MPA), sending the versatile Harrier GR9A into early retirement and trimming the overall number of combat squadrons, Downing Street pre-empted the SDSR's fiercely-guarded publication.

After long speculation, Number 10 confirmed that the MPA gap will be filled by nine Boeing 737-based P-8 Poseidons, the first of which will report for duty later this decade. The UK's carrier strike capability will be accelerated, with a second squadron of short take-off and vertical landing F-35Bs to be ready for deployment

## Fears of a repeat of savage, to-the-bone cuts made in 2010 were in the end groundless

with Queen Elizabeth-class carriers by 2023. Also, threatened cuts to the Eurofighter Typhoon force have been reversed. By 2025, the RAF will have seven frontline units equipped with the model, which also is to remain in use until at least 2040.

Fears of a repeat of the savage, to-the-bone cuts made during the 2010 SDSR were in the end groundless, and errant past decisions to retire C-130J tactical transports and Sentinel R1 surveillance aircraft were reversed.



**Not sure how you'll cope without me...**

There was no hint of a *mea culpa* from Cameron – after all, who could have foreseen the rise of the Islamic State militant group and Russia's adversarial stance, which emerged only after the dust had settled from 2010's axe-wielding? Critics though, would counter that no military that prides itself on being at the top table of capability would ever have opted to throw away battle-proven strike aircraft and maritime patrol assets.

Budget considerations unquestionably won out in the SDSR of 2010, but this time the operational lessons of the ensuing half-decade have helped the UK's armed forces to win arguments about what the genuinely critical capabilities really are.

At first glance, nothing in the newly-published defence review would seem to raise the alarms of the government's first attempt. But in another five years, will the investments being made today in deep-ocean surveillance jets, aircraft carriers and replacement nuclear-attack submarines look at odds with the threats facing the nation's interests? ■

**See This Week P6, News Focus P14**

## A Neo way of doing things

**W**e have become so used to charting catastrophic programme delays – from the A380 to the 787 and CSeries – when a new type makes certification as advertised, it can come as a surprise.

Although re-engining a proven narrowbody is not like developing a clean-sheet superjumbo, all-composite widebody, or your company's first full-size airliner, Airbus deserves credit for doing what it said it would five years ago with the A320neo. To the achievement of a painless path to certification should be added Toulouse's remarkable marketing success. It has sold 4,438 of the A320neo family since 2010 – a three-to-two advantage over the later-to-launch Boeing 737 Max.

Airbus's decision to act when it did – in the wake of

Bombardier's bet-the-farm CSeries launch and while Boeing dithered over whether to re-engine or design an all-new single-aisle – proved the right one. It has left one rival struggling and the other playing catch-up.

After mis-steps in the noughties – the debacle over the original A350 and arguably its faith in the A380 – sense has replaced vainglory in the Airbus boardroom. The A350-800 aside, Toulouse has made sound recent business moves, not least the corporate restructuring of the group under Tom Enders.

Assuming a smooth entry into service for both engine variants of the A320neo family, the airframer looks to have got it right again. ■

**See This Week P7**



For more coverage about UK and international defence topics, visit our landing page: [flightglobal.com/defence](http://flightglobal.com/defence)



# BRIEFING

## BOEING FINALISES EVA AIR SALE

**FLEETS** Eva Air has finalised an order for up to 24 Boeing 787-10s and two 777-300ERs. Originally announced in October 2015, the deal is valued at more than \$8 billion at list prices, which Boeing says makes this Taiwan's largest ever single commercial aircraft buy. Eva – which will become one of the 787-10's launch operators – will employ both aircraft types on medium- and long-haul routes.

## RUSSIA TO STEP UP SYRIAN DEFENCES

**TENSION** Russia responded to the downing of one of its Syria-based Sukhoi Su-24 strike aircraft by a Turkish air force Lockheed Martin F-16 on 24 November by announcing its intention to deploy a long-range S-400 air-defence system to the region. One pilot was killed when the Su-24 was engaged close to the Turkish border.

## SWITZERLAND SIGNS HERMES 900 DEAL

**CONTRACT** Switzerland has signed a production contract with Elbit Systems for six Hermes 900 unmanned air vehicles, following the recent receipt of parliamentary approval for the \$200 million deal. Selected in June 2014, the type is to replace the nation's Israel Aerospace Industries/RUAG ADS 95 Ranger system by 2020.

## BOC AVIATION BOOSTS 737 BACKLOG

**LEASING** Singapore-based lessor BOC Aviation has ordered 22 Boeing 737s, split equally between -800 and Max 8 aircraft. This adds to previous orders for 167 of the Boeing narrowbody, including 50 Max-series jets plus 16 777 widebodies. BOC Aviation's chief executive, Robert Martin, says its investment in the Max will help meet the long-term fleet planning requirements of its customers.

## NEW BOSS NAMED FOR EUROFIGHTER

**LEADERSHIP** The four-nation Eurofighter consortium has approved the appointment of Volker Paltzo as its new chief executive, effective from 1 January 2016. Currently the head of Atlas Elektronik, he will succeed Alberto Gutierrez, who will head Eurofighter business at partner company Airbus Defence & Space in Manching, Germany.

## AUSTRIAN WILL EXPAND SERVICES TO IRAN

**ROUTES** Lufthansa Group carrier Austrian Airlines is to operate four flights a week from Vienna to the central Iranian city of Isfahan from April 2016. Announcement of the new route, which will be served using Airbus A319s, follows the airline's establishment of flights to the Iranian capital Tehran and the signature of a bilateral agreement between the two nations' governments.

## KA-32 FIREFIGHTERS HEADING FOR CHINA

**ROTORCRAFT** Chinese operator Jiangsu Baoli International Investment will take delivery of four Kamov Ka-32A11BC fire-fighting helicopters in 2016-2017. Russian Helicopters chief executive Alexander Mikheev says the supplier hopes to further develop its cooperation "through additional deliveries and new projects".

## MAJOR RESTRUCTURE PLANNED BY ROLLS-ROYCE

**FINANCE** Rolls-Royce is yet to detail the personnel impact from a proposed extensive restructuring programme aimed at simplifying its activities and providing greater transparency. The company states that a "major restructuring" is required to overcome its high embedded costs and the complexity of its business model. It intends to communicate further details on 12 February.

Nine of the type will be introduced by 2025



US Navy

**PROCUREMENT** CRAIG HOYLE LONDON

## P-8 BUY WILL CLOSE UK CAPABILITY GAP

737-based maritime surveillance aircraft will address RAF shortfall caused by scrapping of its earlier Nimrod MRA4s

The UK is to reinstate its lapsed maritime patrol aircraft capability, announcing a planned order for nine Boeing P-8 Poseidons.

Revealed by Prime Minister David Cameron's office ahead of the publication of his government's second Strategic Defence and Security Review (SDSR) on 23 November, the move will fill a void left by the previous version's decision to scrap the Royal Air Force's Nimrod MRA4 while it was still in development by BAE Systems.

To be used for maritime surveillance, anti-submarine and anti-surface warfare tasks, the 737-based type also will help to protect the Royal Navy's submarine-based nuclear deterrent and its future two Queen Elizabeth-class aircraft carriers.

"These roles require an aircraft that can carry torpedoes, as well as being fitted with a broad range of sensors, including radar and sonobuoys," the pre-SDSR statement said. Once introduced, the P-8 "will also provide maritime search and rescue and surveillance capabilities over land."

The most prominent decision contained within a 10-year spending plan worth £178 billion (\$270 billion) for equipment and support, the P-8 buy will lead to the introduction of aircraft to be based at RAF Lossiemouth in

Scotland. While the review does not disclose the type's introduction plan, Cameron told the House of Commons that the first three aircraft are expected to be in place "by the end of this parliament" in 2020. All nine should be operational by 2025.

Introduction of the new type will see the UK follow existing operators the US Navy and the Indian navy in operating the P-8, with the Royal Australian Air Force also having ordered its first four of a planned 12 examples.

Other highlights of the review include a decision to extend operations of the Eurofighter Typhoon by a decade, until at least 2040, and an increase in expected squadron numbers for the type and the Lockheed Martin F-35B. The RAF also is to retain 14 Lockheed C-130J tactical transports previously scheduled for early retirement in 2022, and will extend operations with four of its Raytheon Sentinel R1 ground surveillance aircraft beyond 2020.

The service's command support air transport fleet – which currently totals four BAe 146 aircraft – will be replaced under the plan, which appears to also back a proposed remanufacturing project for the British Army's Boeing/AgustaWestland Apache AH1 attack helicopters. ■

See News Focus P14



**PROGRAMME** DAVID KAMINSKI-MORROW LONDON

# Green light for first of Neo generation

Certification of PW1100G-powered variant of re-engined narrowbody paves the way for several deliveries before year-end

**A**irbus has been cleared to start delivering the A320neo following certification of the Pratt & Whitney PW1100G-powered version of the aircraft.

It secured certification on 24 November under the type's formal designation, the A320-271n, from both the European Aviation Safety Agency and the US Federal Aviation Administration.

Both engine options have been approved. The FAA had cleared the PW1100G last year and EASA granted its own certificate on 30 October. Both authorities have also approved the rival CFM International Leap-1A at engine level, but the full aircraft type certification currently covers only the PW1100G-equipped airframe.

## CLEARANCE

Airbus received the clearance a week shy of the fifth anniversary of the A320neo's launch at the beginning of December 2010. At the time, the airframer expected the re-engined type to enter service in 2016. It subsequently advanced



Airbus

**Airbus promises a 15% fuel-burn saving thanks to the new powerplants and sharklet wing-tips**

the initial delivery date to October 2015, but snags with engine testing took the airframer past this more optimistic target. However, Airbus still expects to deliver a number of A320neos by year-end.

EASA's A320neo type certificate lists eight weight variants – designated 050 to 057 – for the aircraft, with maximum take-off weights ranging from 70-79t.

Nine models of the P&W geared-turbofan engine feature in the separate certificate, from the

PW1122G to the PW1133G, covering maximum continuous power levels of 24,000-32,900lb-thrust (107-146kN). The maximum continuous thrust figure for the Leap-1A35A, according to its EASA type certificate, is nearly 31,700lb. Neither powerplant has yet been approved for extended twin-engined operations.

Airbus says the Leap-equipped A320neo will be certificated "in the coming months", along with the A321neo and A319neo. Chief

executive Fabrice Brégier says the P&W-engined version of the aircraft is "now cleared for its first delivery". It has not, however, specified a handover date.

## FLIGHTS

Three flight-test aircraft powered by PW1100Gs clocked more than 1,070h over 350 flights. Airbus says 300h were performed in an "airline-like environment" to prepare for operational service.

CFM says the test programme for the Leap-1A exceeded 360h and 140 flights. "The Leap engine includes many industry-first technologies," says executive vice-president François Bastin. "The agencies have worked with us to validate the certification plan for these advancements."

Airbus expects the A320neo to cut fuel-burn by 15%, through the fitting of more efficient powerplants and inclusion of modifications such as sharklet wing-tips.

The airframer has secured orders for over 4,400 jets across the A320neo family.

Airbus has also confirmed EASA and the FAA will classify the aircraft as a variant of the baseline A320 under the same pilot type rating.

It says this demonstrates the authorities agree installation of the larger engines on the A320neo "does not significantly change" the handling characteristics of the aircraft compared with its smaller-engined predecessor. ■

## ANALYSIS

### Airbus family stays strong, but smallest sibling falters

Re-engining an already strong-selling narrowbody may have been the safe option for Airbus, but it will have been surprised by the number of orders booked for the Neo family.

Helped by first-mover advantage over rival Boeing, the European airframer has notched a little over 4,400 commitments for the new single-aisles, compared with 2,930 for the competing 737 Max, according to Flightglobal's Fleets Analyzer database.

Although that gap is likely to narrow over time – the 737 Max is not due to enter service until 2017 – at present Airbus holds an impressive 60% share of the market for re-engined narrowbodies.

What may also have been a slight surprise is the paucity of orders for the smallest member of the family, the A319neo. Airbus has taken in

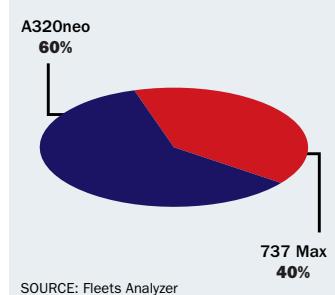
commitments for just 49 aircraft from three customers: Avianca (19), Frontier Airlines (18), and an undisclosed carrier (12).

That equates to slightly over 1% of total firm orders. Although never the best-selling member of the family, over the lifetime of the current programme, the A319 has taken

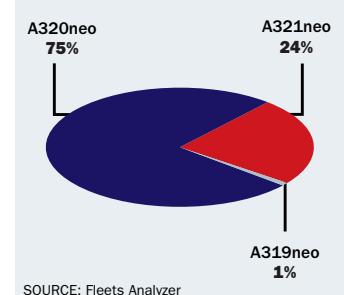
18% of A320-family orders, or 1,473 of the 7,852 total.

The comparatively poor performance of the A319neo has been due to airlines upsizing narrowbody aircraft, with the A320neo (3,337) and the A321neo (1,052) increasing their order share from 60% and 20% to 75% and 24%, respectively. ■

#### RE-ENGINEDED NARROWBODIES - MARKET SHARE



#### NEO VARIANTS - ORDER SHARE





OUTLOOK STEPHEN TRIMBLE WASHINGTON DC

# Bombardier walks financial tightrope

Canadian airframer reveals five-year recovery plan to investors, but needs “flawless” service entry from CSeries twinjets

**A**sking investors and ratings agencies to look beyond a “difficult” year ahead, on 24 November Bombardier executives rolled out a five-year plan that promises to increase topline revenues by 40%, while doubling profit margins by the end of 2020.

Revealed during the company’s annual “investor day” in New York, the initiative unveils key details of a new leadership team’s strategy to recover from recent setbacks including the cancellation and \$2.6 billion writedown on the Learjet 85 programme, and a \$3.2 billion charge and \$1 billion Quebec-funded cash injection into the CSeries.

But it also provides a glimpse of the company’s razor-thin margin for error over the next five years, as executives look to transform its buying and operating practices while restoring its reputation in the critical debt markets.

The first step of the plan seeks to boost profit margins by lowering internal and supplier costs. So Bombardier will transfer low-skill work packages from high-cost centres of excellence in Canada and Northern Ireland to cheaper facilities in Mexico, Morocco and India.

The company also intends to renegotiate long-term agreements

with key suppliers, promising higher volumes in return for pricing discounts. And it also plans to consolidate procurement activity, moving away from segment- and even programme-level buying agents.

At the same time, the airframer will focus on ensuring a “flawless” entry into service and production ramp-up for the CSeries, while remaining on track to complete development of the Global 7000 business jet.

## SLOW RAMP-UP

What had been planned as a three-year ramp-up to full-rate production for the CSeries has been stretched to five years, with Bombardier to deliver 255-315 CS100 or CS300 aircraft over that period, including up to 120 in 2020 alone.

The slower ramp-up gives Bombardier more time to sign fleet orders with the “marquee” airlines it so badly needs. In October, US mainline carrier United Airlines acknowledged interest in the CS100, alongside aircraft from rival Embraer.

With 243 firm orders in the backlog and commitments for nearly another 400 aircraft, the ramp-up extension gives Bombardier’s sales team time to com-



Over 300 CSeries aircraft could be delivered in the period to 2020

Patrick Cardinal/Bombardier

plete such deals. But the five-year plan also exposes the company’s lack of room for error. The financial strategy assumes that

Bombardier can renegotiate \$3.5 billion in debt that matures between 2018 and 2020, including about \$1.4-1.5 billion that comes due in 2018 alone.

But first Bombardier must persuade ratings agencies to restore an investment-grade credit rating – and that is not something it can achieve with a PowerPoint presentation and promises of internal transformation.

Instead, Bombardier must demonstrate over the next four to six financial quarters that it deserves a better rating. That means the CS100 must be introduced on time with lead operator Swiss International Air Lines, perform reliably in service and be produced successfully at even the slower rate that it has promised.

The plan also includes sustaining the company’s existing aerospace product lines at flat delivery rates over the five-year period. Fred Cromer, chief executive of Bombardier Commercial Aircraft, says that projection reflects a “conservative” forecast, and he hopes to deliver more Q400 turboprops and CRJ900 regional jets than currently anticipated.

But executives acknowledge that the forecast is “sensitive” to negative changes in the macroeconomic environment.

If Bombardier executes the plan successfully, revenues will grow from \$18 billion today to \$25 billion by 2020. Operating profit margins will rise from 3-4% to 7-8%, and the company will have a mature production system with the CSeries and Global 7000 driving sales and profits for the next two decades.

## DEVELOPMENT

To get there, the company must struggle through a tough year ahead, with 2016 expected to result in lower revenues, reduced profits and the pressure of maintaining schedules on both development programmes. The picture improves in 2017 with the CSeries through the development stage, but still intense pressure on the Global 7000 programme and the CSeries ramp-up.

If those milestones are met, Bombardier believes it can make a case to the ratings agencies and be able to refinance the debt covenants owed from 2018 to 2020. “Four to six quarters from now, we’ll be in a position to make that case,” says John Di Bert, Bombardier chief financial officer. ■

PROGRAMME STEPHEN TRIMBLE WASHINGTON DC

## CS100 scores ‘100%’ in reliability tests

Bombardier has completed the functional and reliability (FNR) phase of certification test flights on the CS100, with no technology-driven flight delays. Completing the 150-flight-hour activity means the type certification effort moves into the documentation and review stage.

The FNR phase required Bombardier to mimic routine airline operations, with the CS100 assigned to fly into dozens of airports, says Bombardier Commercial Aircraft president Fred Cromer.

The structure of the FNR phase gives the manufacturer an early

glimpse into how the aircraft’s reliability holds up during a simulation of routine operations, Cromer says.

The CS100 appears to have passed the tests with flying colours. “We achieved 100% dispatch reliability,” he says.

Bombardier plans to obtain type certification for the CS100 from Transport Canada by end-year, followed by entry into service in the first half of next year with Swiss International Air Lines.

“We need to be flawless as we enter into service next year with Swiss,” Cromer says. ■



UK interiors firm  
aims high as AVIC  
snaps it up  
**AIR TRANSPORT P10**

**THIS WEEK**

**SPACEFLIGHT JAMES DREW WASHINGTON DC**

## Blue Origin lands New Shepard rocket

Commercial spaceflight start-up Blue Origin achieved an historic first by vertically landing and recovering the launcher stage of its New Shepard suborbital system after delivering a payload to space.

The mission came seven months after the maiden flight of the rocket, which saw an unsuccessful recovery of the vertical launcher. The success of Jeff Bezos' privately-funded space venture at its West Texas launch site on 23 November validates the vertical rocket recovery concept and may put Blue Origin

within reach of routine suborbital space travel.

The company built New Shepard to carry paying customers 100km up, experiencing spaceflight for about 4min.

According to the company, Monday's flight reached 100.5km and a top speed of Mach 3.72. The rocket stage was initially slowed by drag brakes to 387mph (623km/h), before hydraulically-actuated fins positioned the vehicle 5,000ft above the landing pad. The throttleable BE-3 engine was re-ignited as landing gear deployed for the final 100ft. ■



**MISHAP**  
**JAMES DREW WASHINGTON DC**

## Severe damage as X-56A comes down during test

One of two Lockheed Martin X-56A unmanned testbed aircraft built to trial active flutter suppression technology for high-aspect-ratio wings sustained severe damage in a crash at the Rogers Dry Lake range in California.

The Multi-Utility Technology Testbed (MUTT) came down during a 19 November flight. Nicknamed "Fido", the X-56A – and sister aircraft "Buckeye" – are part of an Air Force Research Laboratory (AFRL)-sponsored programme to develop technologies for in-flight flutter and gust load suppression. The goal is new wing designs with 30-40% less drag.

"Initial estimates report severe damage," says the AFRL. "The aircraft previously made 16 successful flights spending approximately 6h in the air." It crashed shortly after take-off on a flight designed to test a non-rigid wing.

"It was the first flight with the flexible wings, designed to explore the lower speed portion of the flight envelope," says the AFRL. "This was an initial check-out flight." It bought two X-56A "centre bodies" or testbed aircraft with two sets of stiff wings and three flexible wing sets from Lockheed.

The AFRL says it will continue with its research using the second centre body and remaining two flexible wing sets.

An accident investigation team has been established to "identify lessons learned and determine how to move forward". It is unlikely the 218kg (480lb) X-56A or its wings will be restored. ■

**ACCIDENT JAMES DREW WASHINGTON DC**

## Brownout caused V-22 stall

USMC Osprey tiltrotor crashed during landing attempt after sand was ingested into engines

A fatal crash involving a Bell Boeing MV-22 Osprey tiltrotor in Hawaii on 17 May could lead the US Marine Corps to adopt an improved engine filtration system in development for the CV-22s operated by the air force.

Two marines died and 20 others were injured when the MV-22 operated by the VMM-161 unit went into "unavoidable freefall" during a restricted visual landing (RVL) at Bellows training area on the island of O'ahu.

Investigators say the training accident was caused by "repeated, sustained flight time in brownout conditions" while attempting to land, after sand and dust ingestion from the rotor wash caused a compressor stall in the port-side Rolls-Royce AE1107C engine.

Recommendations include improving the Osprey's engine air filtration system, and the recommended exposure time during RVLs has since been reduced from 60s to 35s or less, says the USMC.

Pilots should also be provided with more data on stall margins using the cockpit's multi-function displays. It also recommends adding a cockpit warning when engine power drops below 95%.

The V-22 joint programme of

fice is developing an engine inlet barrier filter under the \$70 million Improved Inlet Solution project awarded to Bell Boeing in July 2014, but so far only the air force has chosen it for its CV-22 variant. The upgrade adds "oil-wetted, cotton-media filters" and a bypass door to the engine inlet.

Wind tunnel testing of the modification is scheduled for December 2016. ■

**See News Focus P19**



USMC has cut the time allowed for restricted visibility landings

US Marine Corps

**Flightglobal**  
AVIATION CONNECTED  
IN ASSOCIATION WITH

**EA** Engine Alliance

**Theory of evolution: how four top-selling airliners changed for the better**

[www.flightglobal.com/evolution](http://www.flightglobal.com/evolution)



## RESULTS

DAVID KAMINSKI-MORROW LONDON

## Zodiac reveals €6.1m cost of seating crisis

Cabin supplier Zodiac Aerospace Group has detailed the financial impact of its seat-production crisis, turning in a full-year operating loss in its aircraft interiors division.

The €6.1 million (\$6.5 million) loss contrasts with a €286 million profit in the previous year.

France-based Zodiac admits “insufficient planning” for a more intensive industrial schedule and “poor operational management” led to “significant production difficulties” and late deliveries.

Its analysis traced the problems to two US facilities. The company has staged a recovery plan and started a broader scheme, it says, to “encourage learning from the crisis”. While the group worked to resolve the situation over the last few months of its financial year, it says product cost overruns could not be absorbed as rapidly as expected. Delays have fallen “significantly”, the company says.

But the problems have revealed “vulnerable areas” within the group, it adds, and it is implementing a strategic plan, designated ‘Focus’, to improve processes including operational planning and inventory management. ■

## ACQUISITION DOMINIC PERRY LONDON

## UK interiors firm aims high as China's AVIC snaps it up

Galleys and monuments specialist eyes opportunities in growing Chinese aviation market

UK-based AIM Altitude will be ideally placed for a share of the Chinese aircraft interiors market, thanks to its planned acquisition by state-owned aerospace company AVIC, says group commercial director Richard Bower.

The proposed deal was announced on 22 November, with AVIC agreeing to purchase the company from its current private equity owner TowerBrook Capital Partners for an undisclosed sum. It is expected to close in January, subject to regulatory approval.

Bower says AIM is a “good fit” for AVIC, as it has an “aspiration to be a big player in the sector”.

“They are looking at AIM to create a platform for a big interiors business. They see AIM as a starting point,” he says.

He points out that the growth of aircraft manufacturing and completions in China will provide an ideal opportunity for growth.

Airbus has an existing assembly line for the A320 in Tianjin and will add an adjacent A330 completions facility in the coming years.

Boeing too intends to create a



AirTeamImages

**AIM has previously supplied galleys for China Southern's A330s**

local completions and delivery centre for the 737. AIM is a supplier of galleys to the A320 and A330 programmes, and has a separate division producing bespoke monuments and features, such as the bars for Emirates A380s.

However, Bower stresses that there are no current plans to relocate any of AIM’s operations to China, or to open a facility there.

Aside from the big two Western manufacturers, Comac – which is

part owned by AVIC – is also to produce the C919 in China, presenting AIM with another potential opportunity.

Comac has previously indicated that FACC (China) would supply interior fittings to the C919. Its parent, Austria-based FACC, is 55% owned by AVIC. AIM Altitude was created last year after AIM Aviation took over the cabin division of Air New Zealand, Altitude Aerospace Interiors. ■

## DELIVERIES STEPHEN TRIMBLE WASHINGTON DC

## Russian order helps Boeing with white-tail backlog

Boeing has made progress clearing its backlog of assembled but unassigned 747-8 Freighters – “white-tail” aircraft – with a delivery of two to Russia’s AirBridgeCargo Airlines.

Nonetheless, it still needs to find customers for a further four white-tails parked at its Everett, Washington facility.

The handover on 19 November came five months after AirBridgeCargo parent company Volga-Dnepr signed a memorandum of understanding to buy up to 20 747-8Fs at the Paris air show in June.



**AirBridgeCargo Airlines has taken two 747-8 Freighters**

Boeing says the two newly-delivered aircraft came from that agreement. It had added a pair of freighters to its order book, listed as being destined for an unidentified customer.

The airframer had built six 747-8s with no assigned customer. “We are in active campaigns to place these airplanes, which were built while under contract but cancelled by customers for a vari-

ety of reasons,” says Boeing. The two delivered to AirBridgeCargo “had been previously cancelled by a customer”, it says.

AirBridgeCargo operates eight 747-8Fs; three more than Volga-Dnepr originally ordered almost a decade ago.

Boeing executives have said slow demand for freighter aircraft forced the company to seek “creative” financing options to grow the 747-8 order backlog.

AirBridgeCargo is “renting” the two 747-8Fs, according to the *Wall Street Journal*, with Boeing Capital Corporation the owner. ■



FLEET DAVID KAMINKSI-MORROW LONDON

# Finnair leases 777 to cover for A350

Finnish flag carrier makes temporary move to backfill on transatlantic services after shift to widebody twinjet's deliveries

**F**innair's Airbus A350 delivery schedule has shifted, prompting the carrier to lease a Boeing 777 from a Spanish carrier to cover transatlantic services in December.

The airline had previously stated that it would receive four A350-900s this year, but has recently changed its phrasing, stating only that it will have five of the type by the end of the first quarter of 2016.

Finnair received its first A350 in early October – one of 19 on order – and has just put the type into operation on the Shanghai route. It says, however, that changes in the delivery schedule mean it will temporarily be using a 777 leased from Palma de Mallorca-based Privilege Style.

The latter carrier had previously stated that it was taking a



Airline had planned to take four A350-900s by the end of 2015

299-seat 777-200ER through AerCap this year. Finnair says the delivery of the A350 requires "airline-specific preparations and comprehensive inspections", and had warned of possible "slight changes" to delivery dates.

Two of its own cabin staff will supplement the crew of the 777,

which will be leased over the 7-23 December period, says Finnair.

The carrier is also taking steps to reshape its European operation, with plans to reduce its Embraer fleet and withdraw an ATR turboprop.

The airline had already signalled that it was leaning towards

introduction of larger aircraft types for the short-haul network.

From next May it is to lease a pair of A321s for a year to counter the reduction in the number of smaller aircraft.

It says it is still examining options to acquire "permanent" additional short-haul capacity, but says the temporary lease will serve as a "first step".

"We are adding some capacity to our feeder traffic by upgauging our aircraft size in order to enable our growth," says Finnair chief Pekka Vauramo. "At the same time, some of our traffic is still served most economically by smaller aircraft."

Subsidiary operator Nordic Regional Airlines carries out feeder services on Finnair's behalf, using Embraer 170s and 190s, as well as ATR 72s. ■

## MODIFICATION

DAVID KAMINKSI-MORROW LONDON

### Wiring change boosts A320's taxi efficiency

**A**irbus has secured approval for an A320 modification that allows operators of the type to perform single-engined taxiing without the auxiliary power unit.

Over 20 customers, it says, have expressed interest in the change. Until now, A320 operators have had to keep the APU engaged during single-engine taxiing – a procedure designed to save fuel.

But Airbus says further savings – and environmental benefits – can be achieved without the use of the APU. Its modification involves a wiring change in the engine pylon and around the engine-fire handle. The work can be carried out over a single night.

Airbus estimates customers choosing the modification will see a return on investment in about a year. ■

## MANUFACTURING

DAVID KAMINKSI-MORROW LONDON

### A330-based Beluga XL starts to take shape as fuselage machining begins

**T**he centre wing-box of the A330-based Beluga XL outsize transport should enter manufacturing early next year, with Airbus having already begun cutting fuselage frames.

Various Airbus plants – including Saint Nazaire, Nantes and Hamburg, together with other suppliers – are involved in producing manufacturing drawings, which will feed into work packages for the Beluga XL.

Airbus says these components will be adapted from those developed for its A330-200 freighter.

Machining has commenced at Nantes for the initial fuselage frame 40 – which, on the A330, is located near the leading edge of the wing root.

This "paves the way", says Airbus, to the production of the centre wing-box in early 2016. These parts are for the initial non-

flying test aircraft. "Other 'first cuts' will take place in the very near future," says the airframer, including rear fuselage work at Spanish supplier Aernnova.

Final assembly of the aircraft is scheduled to commence in early 2017, and service entry is planned for 2019.

Airbus is developing the Beluga XL to replace the A300-600ST Beluga, the core of its airborne production logistics operation. Flightglobal's Fleets Analyzer database records Airbus Transport International as currently operating a fleet of five Belugas with an average age of 18 years. ■



Airbus currently uses the A300-600ST for its production logistics



MAINTENANCE MICHAEL GUBISCH LONDON

# R-R brings competition to Trent MRO

Engine manufacturer's overhaul shops set to compete with one another as joint venture aero services are restructured

**R**olls-Royce is opening up its network of overhaul shops for Trent-series engines, to allow them compete with each other and offer time-and-material repair services.

As part of the changes, the UK manufacturer is restructuring the ownership of its Hong Kong Aero Engine Services (HAESL) and Singapore Aero Engine Services (SAESL) joint-venture shops.

The engine maker has previously directed MRO work to approved maintenance centres based on geographical areas of responsibility, but says that in future they must compete against each other to secure business.

This competitive approach will apply to overhauls under the manufacturer's hour-based aftermarket service agreement. But R-R adds that the facilities will be able to "compete globally for MRO services" on time-and-material terms, too.

In addition to the HAESL and SAESL operations, N3 Engine Overhaul Services – its 50:50 joint venture with Lufthansa Technik located near Erfurt, Germany – and R-R's own overhaul shop in Derby each provide MRO services under hour-based aftermarket support agreements.

However, the opportunity to offer time-and-material MRO ser-

vices is also open to independently-approved maintenance centres, such as Delta TechOps and Air France Industries KLM Engineering & Maintenance.

R-R is expanding its MRO network with the aim of increasing overhaul capacity in light of the order backlog for the Airbus A350, which is exclusively powered by the company's Trent XWB engine.

HAESL and SAESL are both currently tripartite partnerships, but will be reorganised as 50:50 joint ventures.

R-R and Hong Kong-based HAECO each control 45% of HAESL, with Singapore Airlines'

maintenance arm holding the remainder. SIA Engineering will sell its 10% shareholding for \$116 million, with the vacated stock being evenly split between the other two shareholders, says the UK company.

In SAESL's case, SIA Engineering owns 50%, while the remainder is split between R-R (30%) and HAESL (20%). The engine maker says it will acquire the latter's share for \$270 million.

As part of that change, International Engine Component Overhaul – a separate parts-repair joint venture between R-R and SIA Engineering – will be integrated into SAESL. ■



The airline had planned more services to the Middle East with the widebodies

Afifanimages

FLEET MAVIS TOH SINGAPORE

## PAL planning wet-lease of underutilised A330s

**P**hilippine Airlines (PAL) is in discussions over wet-leasing some of the 15 Airbus A330-300s in its fleet to other carriers.

"We're not utilising the A330s that much. We're planning to enter into wet-lease agreements with interested parties," says president and chief operating officer Jaime Bautista.

The airline had planned to launch more services to the Middle East using the Airbus widebodies, but intense competition from Cebu Pacific Air and the Gulf carriers means that "the market can't support more flights". ■

Bautista says the airline will add five A321s and two Boeing 777-300ERs to its fleet in 2016, which will be used to support its domestic and regional growth. Next year, the airline will also retire two A320s.

The carrier has a fleet of 55 aircraft in service, comprising six 777s, six A340s, 15 A330s and 28 A320-family jets.

It hopes to have decided by year-end whether to order the A350-900 or 787 to replace the ageing A340 fleet, with deliveries expected from late 2017 or early 2018. ■

INCIDENT DAVID KAMINSKI-MORROW LONDON

## Q400 gear 'retracted too early'

**I**nvestigators probing an accident in which a departing Luxair Bombardier Q400 came to a halt on its fuselage underside have found that the first officer retracted the undercarriage too early.

The aircraft had been taking off from Saarbrucken for Luxembourg on 30 September.

Luxair has disclosed the results of an internal inquiry, based on information from crew interviews as well as data from the Q400's quick-access recorder.

The airline says the first officer activated the gear-retraction mechanism "too early", while the aircraft was still "very close to the ground".

He says the Q400 had achieved a pitch of 5° nose-up rather than the 8° required.

The aircraft did not achieve sufficient lift before the undercarriage was retracted and the turboprop settled, striking its tail and then its nose on the runway before sliding to a halt.

Luxair says the situation was "impossible" for the captain to recover but points out that he "took the right decisions", shutting off the power and using the rudder to maintain directional control.

While both pilots were initially suspended, pending the outcome of the inquiry, the airline says the first officer has been removed from flight duties. ■



Becker & Biedel

Luxair turboprop came to rest on its fuselage at Saarbrucken



**Typhoon and Lightning II set to gain strength from SDSR**  
**NEWS FOCUS P14**



**STRATEGY**  
**MICHAEL GUBISCH LONDON**

## Air Berlin Technik maintains plans for Munich site

Air Berlin insists it will continue base-maintenance operations in Munich despite shareholder Etihad Airways' plans for a low-cost overhaul facility in eastern Europe. At the Dubai air show last month, Etihad disclosed it was "exploring the feasibility" of a narrowbody maintenance facility in Europe with Abu Dhabi investment fund Mubadala, parent of Swiss MRO firm SR Technics.

The site would be used for base-maintenance checks across the Airbus A320 fleets of Etihad partners such as Air Berlin, Air Serbia and Alitalia, Mubadala Aerospace & Defense Services executive director Grant Skinner said.

Air Berlin, however, insists it will carry on performing narrowbody maintenance in-house: "We will continue to conduct A320 base maintenance in Munich," it says. That appears contrary to the restructuring plans put forward by the German carrier's chief executive Stefan Pichler, who says it will in future concentrate on core airline operations.

As part of a previous restructuring, Air Berlin Technik in 2013 consolidated scheduled base maintenance for Boeing 737s, A320s and Bombardier Q400 turboprops in Munich.

SR Technics has become "preferred" maintenance provider for Air Berlin – and other Etihad partners – as part of the intensified cooperation between the Abu Dhabi carrier and Mubadala. ■

**Research into the vortices produced by the Boeing 747 have contributed to the changes**

**SAFETY DAVID KAMINSKI-MORROW LONDON**

## Eurocontrol sharpens 'blunt' wake-turbulence categories

Revision of classifications could enable airports to increase runway capacity by up to 5%

Pan-European air navigation organisation Eurocontrol has refined the classification of aircraft wake-vortex categories to avoid unnecessarily conservative separation at busy airports.

The three primary categories – heavy, medium and light – have become "outdated", says Eurocontrol. Introduction of Airbus A380 operations, which resulted in specific analysis of the type's vortex effects, spurred a broader rethink on classification.

Eurocontrol says the system is fairly blunt, with each category covering a wide range of different-sized aircraft.

It points out the A340-600 and Boeing 767-300 share the same classification despite a 15m (49.2ft) difference in wingspan. Similarly, the A320 and the small-

er Embraer ERJ-145 are both counted as medium jets.

Eurocontrol has detailed its recategorisation, developed under the RECAT-EU scheme, which has six classifications, by splitting both the heavy and medium categories into two new designations.

### REVISED APPROACH

The A350-900 and 787-8 and -9 become "upper heavy", while Boeing MD-11s and 757-200s and -300s will be "lower heavy". The scheme also creates a new "super-heavy" category for aircraft including the A380 and the Antonov An-124.

Revision of the categories will permit typical separation reductions of 1-2nm (1.8-3.7km) for in-trail aircraft during approach.

Eurocontrol says the change

will give airports the chance to re-examine the separations being applied on dense traffic streams, adding it will generate potential runway capacity benefits of up to 5% during peak periods.

Evolving traffic mix, with a trend towards larger aircraft, could raise capacity benefit further by 2020, states a Eurocontrol document on RECAT-EU. "It makes for more accurate and efficient spacing delivery and gives better protection for very small ICAO-rated medium and light aircraft," it adds. "It could significantly reduce airport delays."

Wake-vortex physics research and safety assessments of A380 and 747-8 operations, plus wake data from London Heathrow and Frankfurt airports, contributed to the RECAT-EU scheme. ■

the first in the world!!

**Wide field of view with flat surface KomyMirror<sup>PAT.</sup>**

**Passenger Convenience**

**Shorten Aircraft Turns**

**Cost Savings !!**  
**Saving Non Productive Hour**

**737BSI Stowage Bin**

Komy Co., Ltd. [www.komy.com](http://www.komy.com)



**FIGHTERS** BETH STEVENSON LONDON

# Typhoon and Lightning II set to gain strength from SDSR

Defence review sets out plan to extend life of Eurofighter and affirms commitment to F-35

**P**ublished on 23 November, the UK's Strategic Defence and Security Review (SDSR) sheds light on the government's long-term plans for its combat aircraft fleet, and reaffirms its lead partner commitment to the Lockheed Martin F-35 Lightning II.

Two additional Eurofighter Typhoon squadrons are to be established, increasing the RAF's fleet of the type to seven frontline units, each to comprise around a dozen aircraft. The addition of an active electronically-scanned array radar to part of the fleet and the integration of new ground-attack weapons will extend operations with the type out to "at least 2040", the report says.

The Typhoon's planned out-of-service-date for the UK had previously been set at 2030, and while details of the additional squadrons are yet to be disclosed, they

could initially be formed due to the reversal of a separate proposal to halt operations with the RAF's 53 Tranche 1 production examples by 2019.

Outlining a plan to have a second operational squadron of short take-off and vertical landing F-35Bs under its Joint Force 2025 model, the SDSR states: "We will maintain our plan to buy 138 over the life of the programme."

Three F-35Bs have been delivered to the UK so far, and are currently being used for operational test and evaluation and training in the USA. Another 11 are on order, with the Ministry of Defence having previously committed to acquiring 48 before 2020.

The SDSR does not specify which model/s of F-35 will make up the remainder of the 138-unit total. This leaves open the potential for a mixed order of B-model

aircraft and conventional take-off and landing F-35As.

In a long-term spending review released two days after the SDSR, the government pledged to invest £1.2 billion (\$1.8 billion) over 10 years to ensure that the first of the Royal Navy's two future Queen Elizabeth-class aircraft carriers will be able to deploy with 24 F-35Bs on board from 2023.

No new detail was provided on the future of the RAF's Panavia Tornado GR4 fleet, which provides the UK's manned ground-attack contribution to coalition action against Islamic State militants in Iraq. The aircraft will "continue to operate until they are replaced by Typhoon".

Meanwhile, the SDSR says the UK "will work with France to develop our unmanned combat air system programme, and collaborate on complex weapons". ■



**SPENDING** BETH STEVENSON LONDON

## Surveillance capabilities receive boost with Sentinel, Shadow fleet decisions

The most significant revelation about intelligence, surveillance and reconnaissance platforms in the government's defence review was the announcement of an intent to acquire nine Boeing 737-based P-8 Poseidons to fill a maritime patrol aircraft capability gap.

A P-8 selection had been anticipated, with senior Royal Air Force officials in favour of the type. The UK's Project Seedcorn initiative, which has sought to maintain skills in the area over several years, has seen the bulk of personnel integrated with allied maritime patrol squadrons gain exposure on the US Navy's P-8 operations.

The P-8 was not the only surveillance type to benefit from the review.

The RAF's Bombardier Global Express-derived Raytheon Sentinel R1 ground surveillance aircraft had its retirement date pushed back from 2018 "into the next decade",

despite having been targeted in the Strategic Defence and Security Review of 2010 for retirement at the end of UK operations in Afghanistan.

Documentation released by the Ministry of Defence on 24 November, highlighting the type and Boeing RC-135W Rivet Joint electronic intelligence aircraft fleets having each flown their first 100 sorties against Islamic State militants in Iraq, disclosed four Sentinels will be flown until the 2020s. This indicates

one of the five-strong fleet will retire.

The Sentinel R1 is not listed in the review's Joint Force 2025 overview, indicating the remainder of the fleet will be out of service by then.

Raytheon's Beechcraft King Air 350-based Shadow R1 signals intelligence aircraft will stay in service "until at least 2030", the document states. A surprise disclosure is that the RAF's fleet of five operational examples and a trainer will increase to eight aircraft by 2025.



Six Boeing E-3D Sentry airborne warning and control system aircraft and an eventual trio of Rivet Joints will stay in service until 2035, suggesting the former will be upgraded.

The review contains details about the UK's future unmanned air system inventory. This confirms a plan revealed in October to field more than 20 Protector air vehicles; at least double the number of General Atomics Aeronautical Systems MQ-9 Reapers assigned to the RAF today.

Prime Minister David Cameron referred to a British-designed "new generation of surveillance drone that will fly at the very edge of the earth's atmosphere for weeks". This is presumed to be the Airbus Defence & Space Zephyr high-altitude pseudo-satellite. The review makes mention of "investment in advanced high-altitude surveillance aircraft" to support special forces personnel. ■

Investment will see RAF increase Shadow R1 inventory to eight



**Two more Eurofighter squadrons are to be set up, bringing the RAF's frontline inventory of the type to seven units**

TRANSPORTS CRAIG HOYLE LONDON

## U-turn on decision to retire C-130J fleet

One of the major surprises in the new Strategic Defence and Security Review was a significant equipment boost for the Royal Air Force's air transport fleet – primarily through the reversal of a previous decision to prematurely retire the fleet of Lockheed Martin C-130Js.

Five years after the surprise decision – part of a previous defence review – and more than seven years after the UK National Audit Office warned of an alarming future shortfall in the RAF's tactical airlift capacity, the new document states: "We will upgrade and extend the life of our C-130J aircraft, allowing them to support a range of operations until 2030". The UK's Joint Force 2025 model shows 14 Hercules will stay. These will be the stretched-fuselage C-130J-30s which make up the bulk of the RAF's 23-strong fleet of the type, and modernisation work by Lockheed with support specialist Marshall Aerospace is expected.

The retained C-130Js – formerly expected to leave use in 2022 – will be operated with an eventual fleet of 22 Airbus Defence & Space A400Ms; the first five of which are in

service. The RAF's eight Boeing C-17s will continue to provide strategic airlift capability.

The government says the increased fleet will enable the UK's armed forces "to intervene globally at speed". Its assets will include a fleet of Airbus A330 Voyager tanker/transports, complete at 14 by mid-2016, including a "surge" capacity of five made available as required by service provider AirTanker. The document also reveals a "recapitalised command support air transport fleet" will be introduced, to "ensure we are able to continue to transport the Royal Family and senior ministers cost-effectively".

The RAF's 32 Sqn operates two BAe 146 VIP transports and two of the type adapted for troop transport, but this year retired its last BAe 125 twinjets. The review states: "We will adapt one of our Voyager aircraft so that, as well as its primary air tanking role, it can transport senior ministers securely". Offering "better value for money than the current use of charter aircraft", this could also be made available for use by the Royal Family, it says. ■

## More stability for helicopter fleets

Reflecting major investments in military helicopters over several years, the UK's defence review contains no major surprises.

The review states the armed services will, in 2025, be operating a mix of AgustaWestland AW101 Merlins and Lynx Wildcats, Airbus Helicopters Puma HC2s, Boeing CH-47 Chinooks and Boeing/AgustaWestland AH-64 Apaches – all of them in operational use today. It does not detail the numbers of airframes retained, outlining only that assets will be assigned to a combined 15 operational squadrons across the Army Air Corps, Royal Air Force and Royal Navy Fleet Air Arm.

A major issue which appears to be approaching resolution concerns the Apache attack helicopters flown by the British

Army. Options include an extensive upgrade to 50 of its Block II-equivalent Apache AH1s – to remanufacture them to the US Army's new-generation AH-64E standard for an estimated \$3 billion – or buying new-builds.

In a section outlining the army's status under the Joint Force 2025 model, the report says ground troops will be supported by "upgraded Apache attack and RAF Chinook support helicopters". The review also discloses that one of the RN's two Queen Elizabeth-class aircraft carriers will be "enhanced", to provide support for the Royal Marines' Commando Brigade.

This would involve embarking some of the Commando Helicopter Force's future contingent of upgraded AW101 Merlin HC4 support helicopters.

### JOINT FORCE 2025 – AIR SYSTEMS

Combat aircraft	Number	Current fleet*
Eurofighter Typhoon	7 squadrons	110
F-35B	2 squadrons	3 (IOT&E)
Special mission	Number	Current fleet*
E-3D	6	6
P-8	9	N/A
RC-135W	3	2
Shadow R1	8	5+1 trainer
Airlift	Number	Current fleet*
A330 Voyager	14	8+1 civilian
A400M	22	5
C-17	8	8
C-130J	14	23
Helicopters	Number	Current fleet*
AH-64 Apache	4 squadrons	49
AW101 Merlin HM2	4 squadrons	25
AW101 Merlin HC4	2 squadrons	18
CH-47 Chinook	3 squadrons	45
Lynx Wildcat	6 squadrons	40
Puma HC2	2 squadrons	21
Unmanned systems	Number	Current fleet*
Protector	20+	MQ-9 Reaper
Watchkeeper	3 batteries	In-service
Zephyr	TBC	N/A

SOURCE: UK Ministry of Defence. \*Active inventory, SOURCE: Flightglobal's Fleets Analyzer



**ARMAMENTS** JAMES DREW WASHINGTON DC

# JASSM-ER update to safeguard B-52

Veteran bomber to stay clear of enemy air defences, with extended-range weapon approved for internal carriage

Lockheed Martin has been contracted to arm the US Air Force's veteran Boeing B-52H bombers with one of the service's newest and longest-range conventionally-armed cruise missiles. Under a \$9.1 million deal announced in November, the roughly 54-year-old type will be updated to carry the extended-range version of Lockheed's AGM-158 Joint Air-to-Surface Standoff Weapon (JASSM).

Jason Denney, the company's director of long-range strike systems, says the aircraft will be modified to carry the turbofan-engined missile using its under-wing pylons, and internally on a

new digitised rotary launcher. Already capable of carrying the shorter-range, baseline JASSM on pylons, the bomber's strike distance will be more than doubled, to 500nm (926km). This will keep the non-stealthy platform beyond the range of advanced air-defence systems for years to come, the USAF believes.

Lockheed says the B-52 will join the Lockheed F-16 and Boeing F-15E in having JASSM-ER integrated, with work scheduled to finish on the first two of these types during 2018. The USAF has already deployed the weapon on its Boeing B-1B bomber fleet.

Strengthening the B-52's con-



US Air Force

**Dozens of strategic bombers will lose nuclear strike capability**

ventional armaments comes as the air force removes nuclear weapons capability from dozens of aircraft previously assigned to the strategic deterrence mission, to comply with new arms treaty limitations agreed with Russia. The type's previous main conventionally-armed cruise missile – the Boeing AGM-86 ALCM, with an unclassified range of 600nm – is being retired, as stocks run low.

The JASSM-ER will take advantage of concurrent digital upgrades, which enable every B-52 to carry internal smart weapons for the first time. The Boeing-led combat network communications technology improvement will allow crews to update mission plans via satellite, and retarget weapons in flight. Flightglobal's Fleets Analyzer database records the USAF as having 77 B-52Hs. ■



Airbus Defence & Space

## DEMONSTRATION

### C295 shows Latin moves in Bolivia

A Latin American tour involving the latest production standard of Airbus Defence & Space's C295 medium transport has demonstrated the winglet-equipped type's performance under hot and high conditions. Flown by Mexican navy and Airbus personnel, one of the service's aircraft visited La Paz and Cochabamba air base in Bolivia in late November, with the twin-turboprop's ability to operate from unprepared landing strips also showcased. It made a later stop at Iquique in Chile.

Christophe Roux, head of Airbus Defence & Space in Latin America, says the C295's performance enhancements are "key for several countries in the region". Earlier examples of the type have also been delivered to customers in Brazil, Chile, Colombia and Ecuador.

## SURVEILLANCE

### BETH STEVENSON LONDON

# Tokyo gets approval for Global Hawk purchase

Washington has approved a potential \$1.2 billion sale of three Block 30-model Northrop Grumman RQ-4 Global Hawk unmanned air vehicles to Japan, as testing of a US Navy variant enters a crucial new phase.

In a 19 November notification to Congress, the US Defense Security Cooperation Agency said Tokyo's request – after a type-selection by the Japanese government in 2014 – had been approved via Washington's Foreign Military Sales funding model. In addition to surveillance aircraft, the order will include Raytheon enhanced integrated sensor suites, spare parts and logistics support.

A Japanese defence budget in January provided ¥36.7 billion (\$298 million) for the Global Hawk acquisition, but a final contract has yet to be signed.

The USN launched an operational assessment of its MQ-4C

Triton UAV on 17 November, with the two-month phase informing a Milestone C review to determine the system's readiness for low-rate initial production (LRIP).

Triton aircraft will conduct six assessment flights from NAS Patuxent River in Maryland, performing test scenarios to assess operational performance in intelligence, surface warfare, and amphibious warfare, the US Naval Air Systems Command (NAVAIR) says. It had expected to start the activity during September 2015.

"We worked very hard to demonstrate system performance and stability leading up to the start of operational assessment," says Sean Burke, Triton programme manager at NAVAIR.

A Milestone C decision in early 2016 would lead to a purchase of three LRIP aircraft. The navy plans to buy 68 MQ-4Cs, with the first to be operational by 2017. ■



**Osprey takes fresh  
tilt at CSAR role**  
**NEWS FOCUS P19**

**UNMANNED SYSTEMS** BETH STEVENSON LONDON

# Spain plans to arm Reapers

Madrid will eventually seek permission to use MQ-9 fleet in offensive capacity, air force says

**S**pain will eventually try to weaponise its future fleet of General Atomics Aeronautical Systems MQ-9 Reaper unmanned air vehicles, although its priority is to bring a surveillance-only variant into operation.

Madrid's programme to acquire a "Class III" UAV for its air force began in September 2014, with the Reaper selected in mid-2015 over the competing Israel Aerospace Industries Heron TP.

"The letter of agreement from the US government is about to be signed, and this could be done before the end of the year," Col Enrique Martinez Vallas, former chief of acquisitions programmes for the Spanish Air Staff, told a conference in London on 19 November. He says there are no technical obstacles to adding offensive capability to the Reaper, but the US government would have to authorise any request. Washington eased export restrictions in February 2015, and Italy last month received permission to arm its operational MQ-9 fleet.

Vallas says Spain is for now more concerned with completing its basic acquisition. He notes while the Heron TP and Reaper met the air force's requirements, commonality with NATO allies was a key reason for its selection.

Four aircraft and two ground control stations (GCS) are to be delivered under the proposed deal, and training will begin in 2016, Vallas says. The first two aircraft and one GCS will be delivered the following year, and initial operational capability is expected during 2018. Full oper-



General Atomics Aeronautical Systems

**Initial operations will be conducted in surveillance configuration**

ational capability and the final aircraft acceptance are scheduled for 2020. However, this timetable could be advanced if Madrid can secure earlier production slots.

Meanwhile, the Spanish air force is in the process of acquiring an upgraded variant of the Airbus Defence & Space Atlante UAV that will be able to carry a

multi-sensor and weapons payload. A contract could be signed this year, or soon after the nation's general election on 20 December. The selected variant

"has more capabilities, with automatic take-off and landing, increased endurance and payload" than a model used for earlier testing, Vallas says. ■

**DEPLOYMENT**  
**JAMES DREW** WASHINGTON DC  
**Upgraded E-3G makes combat debut for USAF**

The US Air Force has made the first operational deployment with its newly-upgraded Boeing E-3G airborne warning and control system aircraft, sending the type to support the coalition air campaign which is being waged against Islamic State militants in Iraq and Syria. Launched on 18 November, the deployment marks the Block 40/45 upgrade programme's long-awaited combat debut, after more than 12 years of development, production, installation and testing.

The aircraft "will begin flying combat missions immediately," says Col David Gaedecke, commander of the 552nd Air Control Wing at Tinker AFB, Oklahoma.

Nine of an eventual 24 aircraft have been upgraded through the USAF's Oklahoma City Air Logistics Complex, with 1970s computer technology from the Block 30/35 standard replaced.

"While our tactics, techniques and procedures employing this new capability continue to be refined, exercises like Red Flag allowed crews to gain experience with the system, including capabilities unavailable with 30/35," says Gaedecke. The upgrade comes with a deployable ground system to receive, process and disseminate data as an extension of the aircraft's airborne surveillance, tracking and command-and-control mission.

Boeing started the \$2.7 billion upgrade in 2003, and the E-3G achieved initial operational capability in July 2015, with five modified aircraft. ■

**Download the 2015  
World Air Forces Report**  
[www.flighthglobal.com/waf](http://www.flighthglobal.com/waf)

**IN ASSOCIATION WITH**  
**Together  
ahead. RUAG**



# Flightglobal

AVIATION CONNECTED

# Times are changing... So is Flightglobal.com

We have given our website a complete make-over bringing you an even better experience. Use our simpler navigation to find the news and insights you need. Plus, explore in depth how our products and services can help you.

The image displays three side-by-side screenshots of the Flightglobal website. The central screenshot shows the homepage with a large banner for Wizz Air's A321neo order, followed by sections for the Flightglobal Dashboard, Fleet Forecast, and Fleets intelligence. The left screenshot shows a detailed report titled 'Fleet Forecast' with sections for market understanding, future fleet composition, and delivery examinations. The right screenshot shows a video interview with a man in a suit, with a sidebar for Paris Air Show 2015 news.

Check it out at  
[www.flightglobal.com](http://www.flightglobal.com)



**ROTORCRAFT** JAMES DREW WASHINGTON DC

# Osprey takes fresh tilt at CSAR role

As the V-22 assumes more prominent position in personnel recovery, its manufacturer is hoping for domestic orders lift

**S**ince its first combat deployment in October 2007, the Bell Boeing V-22 has assumed a greater role in rescuing US personnel trapped in conflict zones around the world.

During Operation "Odyssey Dawn" in Libya in 2011, US Marine Corps Bell Boeing MV-22s were instrumental in the rescue of a downed US Air Force Boeing F-15E pilot, who had ejected following a mechanical failure. In December 2013, USAF CV-22s flew 500nm (925km) from Djibouti to South Sudan to extract US embassy staff and citizens. They were attacked on approach, sustaining 143 "hits" that injured four of the 21 special forces rescuers. But the triple-redundant, twin-engined tiltrotors kept flying, and the crews made it out alive.

## QUICK EXTRACTION

Today, several MV-22s are on crisis-response alert as part of the growing multinational air campaign against Islamic State militants in Iraq and Syria, ready to perform quick extractions of US and coalition personnel trapped, wounded or killed in battle.

The USMC "special purpose marine air-ground task force—crisis response" unit in the US Central Command area of responsibility performs what the marines call tactical recovery of aircraft and personnel missions. The USAF calls it combat search-and-rescue (CSAR), and it is a mission for which the inherent speed, range and carrying capacity of the Osprey is "uniquely suited" over traditional helicopters, say advocates of the type.

With Osprey crews gaining ever more experience in such missions, Bell Helicopter is now pitching V-22s to the air force for long-range SAR operations, to be flown alongside the service's existing inventory of Sikorsky HH-60 Pave Hawks and Lockheed Martin HC-130s.

Bell is concerned about a looming dip in production be-



USAF CV-22s were deployed to pick up embassy staff and citizens from South Sudan in late 2013

**"In the Middle East, a conventional helicopter cannot perform missions in a timely manner"**

**PETE ROBICHAUX**

Senior manager, air force business, Bell

tween the USAF and USMC completing buys of 52 CV-22s and 360 MV-22s, respectively, and the ramp up of HV-22 production in 2020 for the US Navy. The latter has funded the procurement of 40 aircraft initially, for the carrier onboard delivery mission.

With few firm foreign orders, besides five MV-22s for Japan, Bell and the USN's V-22 joint programme office are calling for as many domestic and/or international orders as possible ahead of a five-year, Multi-Year III contract being formulated for fiscal year 2018.

Air force leaders have expressed interest in incorporating the CV-22 more into the CSAR role, but with the multi-billion-dollar recapitalisations of the HH-60G and HC-130 Hercules already under way, there is little appetite for new spending, and no firm commitment.

Bell believes more CV-22s are needed, to fill a high-speed, long-distance combat rescue gap.

"When you look at what's going on in the Middle East and you look at a continent like Africa, a conventional helicopter cannot perform the mission in a timely enough manner to change the outcome for an airman or anyone else that needs to be picked up when time is working against you," says Pete Robichaux, the company's senior manager for air force business development. "That is the benefit the V-22 brings."

## CAPABILITY

"If you're sitting on a life raft or on the ground, who do you want to come and get you? It needs to be the best capability the nation can provide, and speed and range are extremely important," adds Keith Daniel, the company's director of global military business.

The Osprey's aircraft-like characteristics in forward flight give it approximately twice the speed and between two and three times the range of conventional rotorcraft designs, according to the USMC. It has a maximum speed of about 260kt (480km/h) and an unrefuelled combat radius of 425nm (780km), compared to

75nm for the tandem-rotor Boeing CH-46E Sea Knight it replaced.

"It's a great platform for the CSAR mission, but at this time it's not funded," US Naval Air Systems Command V-22 programme manager USMC Col Dan Robinson said at the Dubai air show. The USAF – which has already committed \$8 billion to buy 112 new HH-60W combat rescue helicopters (CRH) through 2029 and to also replace its HC-130N/Ps with newer J-models – expressed little interest in procuring a third CSAR aircraft type in a response to *Flight International*.

The air force says it has considered "concepts" for using CV-22s for CSAR, but there has been no formal analysis.

"Any discussion on pursuing additional resources for personnel recovery will need to evaluate the costs and benefits of adding another aircraft type to diversify the fleet, versus adding to the existing total of CRH aircraft," the service says. "While the CV-22 is capable of conducting some personnel recovery missions, formally augmenting the USAF's personnel recovery mission would require additional coordination within the DoD [Department of Defense] and with Congress." ■



Around 1,600 turboprop singles could be eligible for the revamp

**PROPELLION** KATE SARSFIELD LONDON

## Caravan engine upgrade approved for Blackhawk

**U**S engineering company and aftermarket specialist Blackhawk Modifications has secured US supplemental type certification for its Cessna 208 and 208B Caravan engine upgrade, and says it has launched a worldwide certification effort to boost sales of the single-engined turboprop revamp.

The upgrade with the 867shp (647kW) Pratt & Whitney Canada PT6A-140 engine replaces the 600/675hp version of the PT6A installed on Caravans without the Garmin G1000 flightdeck, which Cessna introduced in 2008 as a standard feature on all of its Caravan models.

"Federal Aviation Administration certification now allows

Blackhawk to quickly install this extremely cost-effective system that is going to take operators above and beyond their current capabilities," says Jim Allmon, chief executive of the Waco, Texas-headquartered company.

"The system allows operators to retain many components from their original -114/-114A engines, while boosting performance," he adds.

Blackhawk says upgrade slots are filling up fast, and names US float manufacturer Wipaire as one of the first customers.

Flightglobal's Fleets Analyzer database records a fleet of more than 2,300 Caravan turboprops, of which around 1,600 are suitable for the upgrade. ■

**CERTIFICATION** KATE SARSFIELD LAS VEGAS

## Nextant given the green light for G90XT deliveries

**N**extant Aerospace has secured US certification for the G90XT twin-engined turboprop, and will deliver the first examples of the \$2.75 million remanufactured Beechcraft King Air C90 next year.

The programme was launched by Nextant two years ago in partnership with engine manufacturer GE Aviation, with the G90XT having made its first flight in January

2015. The upgraded aircraft features 750shp (560kW) GE H75-100 turboprops – which have a time between overhaul of 4,000h – a Regent flightdeck, based on the Garmin G1000 avionics suite, a redesigned interior and cockpit and a new digital pressurisation system.

"When we launched the G90XT our goal was to deliver an entry-level, twin-engine turboprop that

**DEVELOPMENT** KATE SARSFIELD LONDON

## Gulfstream boosts G500 fleet to three

New pair of test aircraft join programme, as airframer ups the pace ahead of 2018 service entry for large-cabin type

**D**evelopment of the Gulfstream G500 large-cabin business jet made another advance on 20 November, with the manufacturer's second and third prototypes joining the flight-test campaign.

Aircraft T2 took off from Gulfstream's headquarters in Savannah, Georgia, and during a 3h 3min flight, climbed to 43,000ft, reaching a maximum airspeed of 300kt (555km/h), or Mach 0.85.

T2 will concentrate on performance and systems testing, and be used for flight loads validation.

T3 took off the same day, reaching 45,000ft during a 2h 25min sortie. The aircraft is the testbed for the Symmetry flightdeck – powered by Honeywell's Primus Epic system – and will evaluate the ice-protection system, landing gear, nosewheel steering operation "and other mechanical systems", says the airframer.

The clean-sheet, 5,000nm (9,250km)-range G500 was launched in October 2014, along with longer-range stablemate the G600 – scheduled to begin flight testing next year. Since the first Pratt & Whitney Canada PW814GA-powered G500 test aircraft took off in May, T1 has notched up 170h in 47 missions, reaching 50,000ft and speeds of up to M0.995, Gulfstream says. The latter is a certification requirement for the G500, which will share the top-of-the-range G650's maximum operating speed of M0.925.

Five aircraft will be used in the test campaign, with T4 and the first production aircraft joining the certification effort over the next 12 months. Type certification and service entry of the \$43.5 million G500 are slated for 2017 and 2018, respectively. Validation and first deliveries of the G600 are pegged for 2018 and 2019. ■

**Aircraft T3 got airborne from Savannah headquarters on 20 November**



Gulfstream Aerospace

offered the best combination of overall value, performance, and cabin comfort in the category," says Jay Heublein, executive vice-president of global sales and marketing for the Cleveland, Ohio-based company. "We specifically focused on creating the safest single-pilot operating platform in the industry, and the G90XT has exceeded our expectations."

Nextant is offering several cabin

configurations for the G90XT including an air ambulance, a three-seat executive interior and a five-seat high density passenger version.

The new product will join Nextant's 400XTi light business jet – a remanufactured Hawker 400/Beechjet 400A. The seven-seat type entered service in 2013, and more than 60 have been delivered to date. ■



**Airbus spins up a  
Romanian revival**  
**NEWS FOCUS P25**

**GROWTH KATE SARSFIELD LAS VEGAS**

# Wheels Up trains its sights on Europe

US-based membership operator wants to open up corporate aircraft market, with London and Paris eyed as potential hubs

**M**embership-based Beechcraft King Air 350i operator Wheels Up plans to launch a European programme in 2016, and expects its first twin-engined turboprop "on the ground" early next year. Speaking to *Flight International* at the National Business Aviation Association convention in Las Vegas, Wheels Up founder and chief executive Kenny Dichter said the company is evaluating possible bases.

"If you look at a map of western Europe there are over 55 key cities that the 350i can connect non-stop

from three possible base locations," he says. These could include London City airport and Paris Le Bourget, which Dichter describes as the continent's "most heavily travelled city pair" for business aircraft users.

New York-headquartered Wheels Up began operations in August 2013 on the back of a record order for up to 105 350is. To date, 35 of the bespoke eight-passenger turboprops are in operation, supporting Wheels Up's 2,000 members, along with 15 pre-owned Cessna Citation XLS

superlight business jets. Another five King Airs are scheduled for delivery by year-end.

"Since our launch, we have helped to revolutionise the private aviation space in the US by lowering the price barrier to entry," says Dichter. "We want to do the same in Europe."

He likens the business aircraft market to a pyramid of around 60,000 users. At its apex are the "tiny percentage" of high-end business jet customers, Dichter says. "With Wheels up, we are opening up the pyramid to a lot

more people and believe we can grow it to a million users."

To help fund its European arm, Wheels Up in September raised \$115 million from private investors. It has appointed UK business aviation services provider Gama Aviation to operate its 350is – an extension of the partnership between the programme and Gama's US subsidiary Gama Charters.

"The company is already a long-established King Air maintenance provider and operator, so it is well placed to support our fleet in Europe," says Dichter. ■



The midsized business jet will be cleared to use London City airport

**OPERATIONS KATE SARSFIELD LONDON**

## Legacy 500 angles in on steep-approach approval

**E**mbraer's Legacy 500 is poised to receive approval from London City airport and the European Aviation Safety Agency for steep-approach operations, permitting the midsized business jet to perform approaches at descent angles of up to 5.5°.

The eight-seat aircraft, which gained EASA certification a year ago, will be the fifth business jet in Embraer's line-up cleared to operate at steep-approach airports. Similarly restricted destinations include Lugano-Agno and Sion in Switzerland.

London City is one of the most popular destinations for business jets in Europe, due to its proximity to the capital's financial district.

The Legacy 500, and superlight

stablemate the Legacy 450 – expected to secure similar approvals early next year – can fly approaches with glideslopes as steep as 7.5°, says Embraer.

Meanwhile, the airframer has received a letter of intent from global hospitality company MGM Resorts International for three Lineage 1000E VIP airliners and the same number of Legacy 500s.

Deliveries to the US-based company – owner of 20 upmarket hotels and casinos including the MGM Grand, Mandalay Bay and Bellagio's on the Las Vegas strip – will begin at the end of the year.

The aircraft will replace MGM's fleet of Boeing Business Jets and Gulfstream types and will be used for VIP customer transportation. ■

**DELIVERY KATE SARSFIELD LONDON**

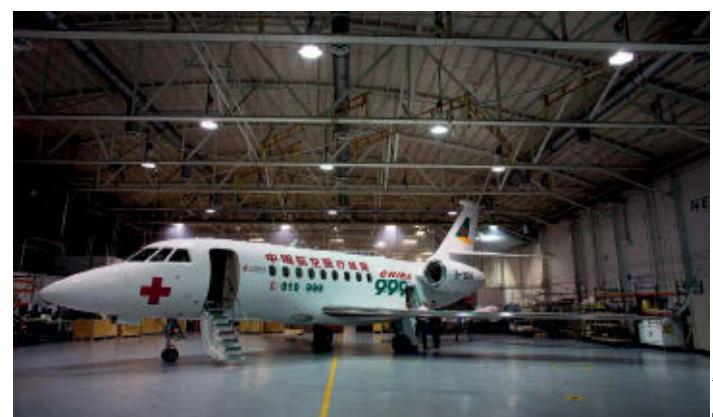
## Medevac missions for Dassault demonstrator

**O**n 23 November, Dassault delivered a Falcon 2000LX business jet to Chinese medical evacuation provider Beijing Red Cross Emergency Medical Center (999).

The large-cabin business jet – previously used as a customer demonstrator – is the first fixed-wing aircraft in China equipped for air ambulance missions, says the French airframer. Completed at Dassault's maintenance, repair and overhaul facility in Wilmington, Delaware, the 4,000nm- (7,400km) range twinjet features an electrical patient loading system and medical suite – including stretcher,

dedicated lighting, a three-bottle oxygen supply and monitoring and analysis equipment. Dassault says 999 is the first air medevac provider in China to launch a "three-dimensional rescue package", combining ambulances, helicopters and fixed-wing aircraft. "In the decade it has been in operation," it says, "999 has provided pre-hospital rescue and medical treatment service for over 3 million patients."

Two other medevac-configured 2000LXs are in service with the French air force's 60th transport squadron. ■



Large-cabin aircraft is the first fixed-wing type in operator's fleet



**FROM BUENOS AIRES TO THE  
A BETTER WAY TO FLY.**

# BOTTOM LINE



Boeing builds airplanes that enable airlines to fly profitably day after day, year after year. From leadership in fuel efficiency to total fleet reliability, Boeing airplanes minimize operating costs and maximize profit potential. So no matter what your business model, the bottom line climbs higher. That's a better way to fly.



The key players in aviation rely on us for the most trusted, reliable and timely fleet data, intelligence and insight when they need it most.

## Introducing Flightglobal Fleets Analyzer

One simplified, online platform designed with flexibility and built upon an unmatched level of quality data.

Find the next deal in aviation and quickly access the most comprehensive view of the global fleet anytime, anywhere.

*Request your trial today.*

Visit [flightglobal.com/fleetsanalyzer](http://flightglobal.com/fleetsanalyzer)

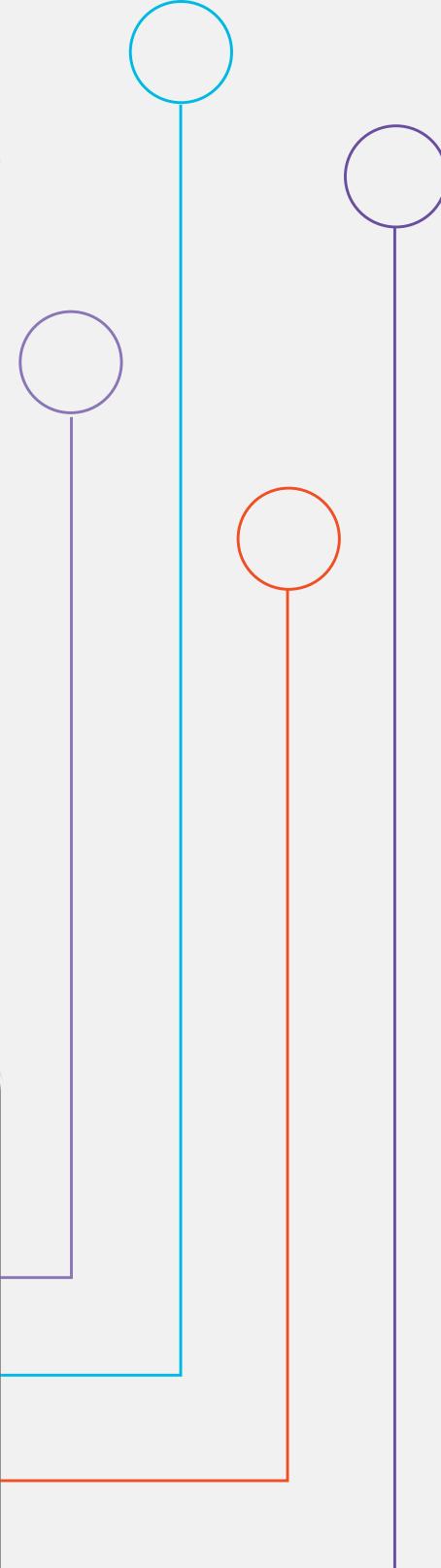
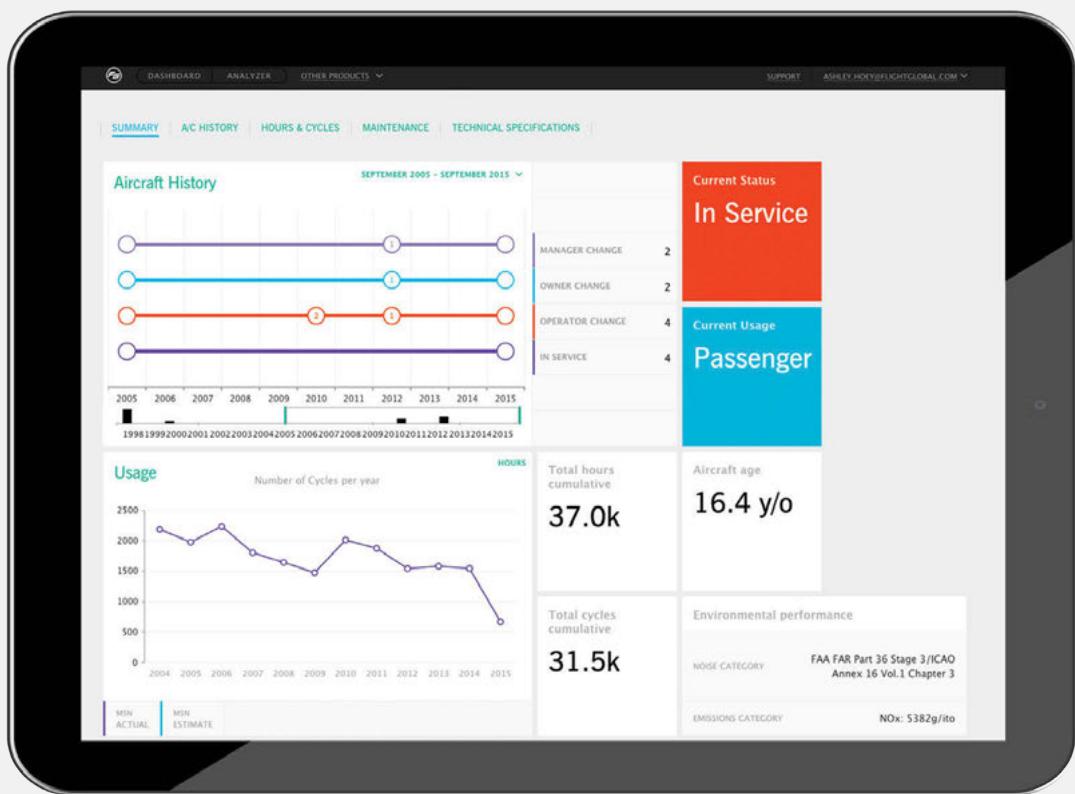


Illustration shows conceptual data only



**ROTORCRAFT DOMINIC PERRY BRASOV**

# Airbus spins up a Romanian revival

Airframer's investment in eastern European operation in Brasov will mark a new industrial model for helicopter production

Romania once had a thriving aircraft-building industry, with state-owned IAR specialising in helicopters – mostly licence-built examples of the Aérospatiale Alouette III and Puma. But those days are gone. Rotorcraft still represent the bulk of activities at IAR's Brasov facility, but it is upgrade or maintenance work, either by IAR or Airbus Helicopters Romania, a joint venture in which the Romanian firm holds a 49% stake.

But IAR occupies a fraction of the space it once did. Viewed from above, the decline is clear: grass and weeds choke open areas and saplings sprout from shuttered buildings. Romania has not assembled an aircraft since the last IAR-99 jet trainer in 2004. The industry appears deceased. But this is Transylvania – Dracula's castle is half an hour away – and things here have a reputation for refusing to stay dead.

## REANIMATED

In fact, it is Airbus Helicopters that hopes to revive aircraft manufacturing in the country. It has set up a new wholly-owned subsidiary in Romania – Airbus Helicopters Industries – and is investing €50 million (\$53.2 million), including €5 million from the European Union, in the Brasov site to create a 10,000m<sup>2</sup> (108,000ft<sup>2</sup>) assembly line. From 2017, this will produce new versions of its legacy AS332 Super Puma. The 8.6t medium-twin itself is also in need of reinvigoration – it has suffered in relation to the newer, larger, and more capable H225, without being sufficiently cheap to break into a utility market dominated by Russian Mil Mi-8s and Mi-17s.

Airbus had already made a tentative assault on the segment, launching in 2012 the AS332 C1e. Envisaged as a low-cost model with a simple baseline configuration and limited list of options, this gained the highly-regarded avionics and four-axis autopilot



Dominic Perry/FlightGlobal

**H215 will build on the innovations introduced on the AS332 C1e**

from the H225. Sales have been moderate, with 20 orders so far.

But with the Brasov factory, the manufacturer believes it can go further. Aside from a 15% reduction in labour costs in Romania, it will configure assembly around a flow-line concept, speeding production and supporting cost reduction. A further simplification of the baseline helicopter and options list will also take place. All of which, Airbus believes, will enable manufacturing time to be cut to 11 months, down from 18.

The helicopter is also redesignated, becoming the H215, in common with the firm's new naming convention.

Describing the move as a "very

how, the environment, and the willingness to make a successful company and a successful product," he says.

Fauré says the H215 was built around the requirements of the market and the "shortcomings of existing solutions". It is, he says, designed to deliver on customer expectations for a "reliable, robust [helicopter] that is fast to market and very competitive".

Those shortcomings include the UN's increased willingness to insist on European Aviation Safety Agency or US Federal Aviation Administration certification in its tenders for helicopter operations, which plays against Russian-approved Mil models.

And, says Benoit Terral, sales promotion manager for the type, spares availability is also a major headache for operators: "When we discuss with operators of the Mi-17, the big concern is that they don't know whether Russia will deliver major parts or not."

The H215 will continue to be available as long- or short-fuselage models – 76cm and 150kg (331lb) separate the two – but the latter will be stripped down, says Terral, trimming empty weight by around 250kg to 4.2t and turning it into an all-round utility and aerial work platform. Items removed include the air intake particle separators (saving 80kg) and the rear cargo door (30kg).

As well as reviving aircraft

**"We will grow the capability and knowhow, but it is too early to talk about future potential"**

**GUILLAUME FAURÉ**

Chief executive, Airbus Helicopters

important investment", Airbus Helicopters chief executive Guillaume Fauré says the "streamlined industrial model" will enable it to produce "one of the most affordable heavy helicopters in the world" at Brasov.

"We have everything in place – the product, the skills, the know-

building in Romania, Airbus Helicopters hopes to build up the local supply chain, through work packages and encouraging its broader supplier base – engine maker Turbomeca, for instance – to transfer work to the country.

However, says Fabrice Arfi, vice-president of business development, that will require them to "pump up their standards".

IAR, which already fabricates sheet metal components for the Super Puma, could also play a part, particularly given its history with the type. And, if local suppliers are successful on the H215, they may be offered work on other models too.

## POTENTIAL

Although the new site and associated production process encourages speculation other models could be produced in a similar low-cost way in Romania, Fauré is adamant that this is not the case, at least in the immediate future.

He describes the Brasov development as a "fully fledged solution" unique to the H215, which is "an industrial and product approach to the market". He says: "It will evolve, but we are at the beginning of the story. We will grow the capability and knowhow [in Brasov], but it is now too early to talk about future potential."

Securing production ramp-up to 15-20 helicopters per year and ensuring the H215 captures market share is "already a broad project", he points out.

However, it is not entirely clear cut. The H215 needs to sell, otherwise a €50 million production facility will be left, if not idle, at least not working to full potential. In which case there appears to be a contingency plan: "We believe in the market, so that scenario [of limited orders] is unlikely. But the mitigation plan is potentially other platforms," says Arfi.

But regardless of what is eventually built, Romania's aircraft manufacturing industry seems to have regained its bite. ■

The ATR 72's principal competition in the turboprop sector comes from Bombardier's Q400



# REGIONAL RIVALS

Three manufacturers retain a stranglehold on the market for aircraft with fewer than 100 seats, but new arrivals, particularly from Mitsubishi Aircraft, could change that

GUNTER ENDRES LONDON

For the time being, the regional aircraft market remains the province of ATR, Bombardier and Embraer, with the Canadian firm the only manufacturer producing both jets and turboprops.

But they will soon have to share the market with new challengers. Although the long-overdue Comac ARJ21 has encountered the same problem as the Sukhoi Superjet 100, in that it has failed to trouble the international market, the vast majority of orders for the Mitsubishi Aircraft MRJ90 are from outside of its home region.

The Japanese firm, which has built on many years of co-operation with Western

manufacturers, would appear to have a head-start. China's Comac, on the other hand, has battled its inexperience in systems integration and all the other minutiae that go into the development of a brand-new aircraft. Only a period of actual in-service operation will show if performance matches up against aircraft from Bombardier and Embraer, both of which are undergoing significant upgrades to enhance fuel efficiency and passenger comfort.

**Bombardier and ATR continue to make improvements, but there are no new models on the horizon**

On the turboprop front, the market remains divided between ATR, with its 42- and 72-600 models, and the competing Q400 from Bombardier, with the Xian Aircraft MA600/700 from China the only other active product. Russia, meanwhile, is intending to revive the Ilyushin Il-114 to fulfill its requirements for a new regional turboprop having ditched plans for local Q400 assembly.

Both Bombardier and ATR are continuing to make improvements, but there are no new models on the horizon from either manufacturer. A few years ago, both established and new players were making serious plans for the development of the next-generation turboprops with 70-90 seats; this potential new market has now been discarded as a

viable proposition, but probably for the wrong reasons. Financial problems have forced Bombardier to shelve plans for a 90-seat version of the Q400, while Alenia Aermacchi's plans have come up against opposition from its ATR joint venture partner Airbus, although as an interim measure a high-capacity variant with 78 seats is available.

India's RTA-70/90 project remains mired in bureaucracy and inertia and is unlikely to see the light of day any time soon, while South Korea has quietly discontinued work on its planned 90-seat project. Only the Xian Aircraft MA700 remains active in China, while a new project between US-based Sierra Nevada and Turkish industry is moving forward with the revival of the Dornier 328 and 628 programmes, which will include both jet- and turboprop-powered versions. However, success is not guaranteed.

### In its latest assessment, Bombardier predicts that the 60- to 100-seat segment will continue to be very dynamic in commercial aviation

While North America continues to dominate this market, Asia, and in particular China and India, will drive demand in the coming years, although all sectors will have to contend with challenges in aircraft financing, fluctuating oil prices, and environmental concerns, which are forcing manufacturers to constantly improve fuel burn and noise levels.

But if China, Russia, India and Japan, all of which are imminently bringing new aircraft to the market, are to emerge as significant players to seize a large share of the 5,000-6,000 new aircraft expected to be required over the next 20 years, it is essential for governments to make the development of the industry a national priority, and to build around a single company in order to create a sustainable scale to development and manufacturing.

Although all these countries currently have the advantage of low labour costs, these will be eroded over time and global competitiveness must be maintained in both performance and cost through technology and efficiency.

In its latest market assessment, Bombardier predicts that the 60- to 100-seat segment will continue to be one of the most dynamic, anticipating a doubling of the fleet, creating a demand for 5,700 new aircraft. Deliveries are expected to be spread equally between regional jets and turboprops, with lower fuel prices favouring regional jets. ■

## Antonov An-132

**A**ntonov has embarked on a new multi-purpose transport aircraft in partnership with Saudi Arabia's Tacnia Aeronautics.

Designated the An-132 and based on its An-32 high-wing aircraft, the Ukrainian manufacturer has stated that the design has been completed and airframe metal-cutting is under way. The new turboprop will be powered by two

Pratt & Whitney Canada PW150A engines and will have mainly Western-sourced equipment.

A prototype will be assembled in the second quarter of 2016 and will then be transferred to Saudi Arabia for test flights in challenging climatic conditions, the company says.

The aircraft is expected to enter service in 2020. Its high thrust-to-weight ratio will make it suitable for hot and high climates and all types of runway. Cargo capacity is 9.2t on short- to-medium routes, but it will also be marketed for personnel transport, parachutists, and as an aerial ambulance. Antonov projects a market of 200 units up to 2025. ■

## Antonov An-140

**T**he future of this high-wing, twin-turbo-prop aircraft, designed as a direct replacement for the aged 52-seat An-24/26 family, has been put further in doubt as a result of the continuing conflict in eastern Ukraine.

Samara, Russia-based Aviacor has announced the suspension of manufacture due to disruption to the supply of components and parts from Ukraine, but had hoped to be able to start production of 14 An-140T ramp-loading cargo transports for the Russian military as soon as the supply situation eases.

### LICENCE PRODUCTION

But signs are not good. Russia is now understood to have abandoned the An-140T in favour of re-starting production of the Ilyushin Il-112 and Il-114. The Il-112 will be produced by the VASO plant at Voronezh, which may then discontinue the licence production of the An-140. Earlier this year, Russia's only operator of the type, Yakutia Airlines, was forced to ground three of its four An-140s for lack of spares.

Although the An-140 first flew in September 1997, it did not enter service until 2002, since when only 19 have been produced by Aviacor by the Kharkov Aircraft Production Plant in Ukraine and by HESA in Iran (as the IrAn-140).

In a last-ditch attempt to boost the aircraft's prospects, Rosoboronexport, Aviacor and Italy's Elettronica signed a package of co-operative agreements in December 2013 to fit the aircraft with modern electronic and radio equipment. This was part of Aviacor's plan to develop an entire multi-purpose family for the aircraft, including maritime patrol and reconnaissance. The implementation of this agreement now also appears to be doomed. ■

### DATA CHECK (TO 30 SEPTEMBER)

#### An-140-100

First flight	17/09/1997
Net orders (total/2015)	19/0
Deliveries (total/2015)	19/0
Backlog	0

### SPEC CHECK

#### An-140-100

MTOW (t)	21.5
Seats (single-class)	52
Range (km)	2,420



Aviacor had hoped to produce 14 ramp-loading An-140Ts for the Russian military

# WORLD AIRLINER DIRECTORY

## SPECIAL REPORT

### ATR 42/72

**D**ifficult economic conditions have damped last year's resurgence of the turboprop, but ATR has continued to outsell its competitors in the market for regional aircraft with fewer than 90 seats in 2015. At the Paris air show in June, ATR announced it had taken firm orders for 46 aircraft (35 ATR 72-600 and 11 ATR 42-600), with another 35 options, representing a total value of \$1.98 billion, including options.

Since its launch in 2007, the -600 series has passed 500 firm orders. The most significant contract announced at the show was one from Japan Airlines for 23 ATR 42-600 (eight firm plus 15 options) for its Japan Air Commuter subsidiary. This contract marked ATR's first from a Japanese airline, and the 1,500th aircraft sold since the beginning of the programme. Cebu Aviation of the Philippines signed for 26 ATR 72-600s, including 16 firm and 10 options, and other sizeable follow-on deals were concluded with Binter Canarias and Braathens. Air Madagascar became a new customer, ordering three ATR 72-600s in March, for delivery from 2017.

The current -600 series production models entered service in August 2011. These incorporate a new Thales avionics suite with glass cockpit including five 6 x 8in (15 x 20cm) LCD screens, multi-purpose computer for increased flight safety and operational capabilities, reduced maintenance costs

#### DATA CHECK

	ATR*	ATR 42-500	ATR 42-600	ATR 72-500	ATR 72-600
<b>First flight</b>	16/08/1984	16/09/1994	04/03/2010	19/01/1996	24/07/2009
<b>Net orders (total/2015)</b>	471/0	121/0	63/11	360/0	451/50
<b>Deliveries (total/2015)</b>	471/0	121/0	20/4	360/0	237/44
<b>Backlog</b>	0	0	43	0	214

\*first-generation ATR 42/72 aircraft

#### SPEC CHECK

	ATR 42-500	ATR 42-600	ATR 72-500	ATR 72-600
<b>MTOW (t)</b>	18.6	18.6	22.5	23
<b>Seats (single-class)</b>	48	46-50	70	74-78
<b>Range (km)</b>	1,555	1,483	1,650	1,665



ATR continues to outsell its competitors

through an integrated aircraft centralised maintenance system, more powerful Pratt & Whitney Canada PW127M multi-rated turboprop engines providing increased hot-and-high operations and short take-off performance, and a more comfortable and enhanced cabin design with lighter seats and larger overhead baggage bins.

#### UNPAVED RUNWAYS

The ATR 72-600 received its European Aviation Safety Agency certification in June 2011, followed by the ATR 42-600 a year later. Both models are certified for 120min ETOPS, and for operations from unpaved runways in the east of Russia.

Latest developments announced for the -600 Series include the deployment of a new wind shear detection system, a new ATR “-600” avionics system for more precise

### AVIC Xian MA60

**C**hina's MA60 (Modern Ark 60) high-wing turboprop, a 60-seat stretched version of the Y7-200A, itself based on the Antonov An-24, has had limited success domestically and in the international market in Asia/Pacific and Africa, having sold around 150 aircraft since first flight in 2000. Thailand had plans to buy 10 aircraft this year for cloud seeding missions, but no further details are known.

In 2009, flight tests began on the MA600 development, which is claimed to provide improved fatigue life and maintainability, with its Pratt & Whitney Canada PW127J engines and four-blade Hamilton Sundstrand propellers contributing to improved runway performance. It also has the Rockwell Collins Pro Line 21 avionics suite.

The first aircraft was delivered to the Civil Aviation Flight University of China in December 2010, with the first international de-

#### DATA CHECK (TO 30 SEPTEMBER)

	MA60	MA600	MA700
<b>First flight</b>	25/02/2000	09/10/2008	2016
<b>Net orders (total/2015)</b>	148/-4	12/0	185 (commitments only)
<b>Deliveries (total/2015)</b>	86/2	4/0	0
<b>Backlog</b>	62	8	0

#### SPEC CHECK

AVIC Xian Aircraft MA60	MA60	MA600	MA700
<b>MTOW (t)</b>	21.8	21.8	26.5
<b>Seats (single-class standard)</b>	60	60	68-86
<b>Range (km)</b>	1,600	1,430	2,700

livery to Lao Airlines taking place in February 2012. A trickle of contracts has since brought the order book to 12, of which four have been delivered.

AVIC Xian Aircraft has frozen the design of its in-development MA700, a stretched version capable of seating 68-86 passengers. The MA700, formally launched in December 2013, will have new technology P&WC PW150C engines with 5,000lb-thrust (22.25kN), revised gearbox and improved fuel burn, Pro Line Fusion avionics system, cou-

pled with the HGS-3500 head-up guidance system, fly-by-wire controls, advanced aerodynamic design, composite materials and active noise suppression. Fuel burn is expected to be 20% lower and direct operational cost 10% lower than the MA600.

The new-generation aircraft is on schedule to complete final assembly by end of 2016, with first flight in 2017, and entry into service expected in 2019.

The company announced in August that it had received 185 commitments from airlines

airport final approaches (RNP 0.3/0.3), and the ClearVision enhanced flight vision system (EFVS) available for the first time on a commercial aircraft. ClearVision EFVS provides the pilot with head-up information about the flight by means of the Skylens, which is worn on the face. A contract was signed in July with Elbit Systems for the integration of ClearVision into new-build -600 Series aircraft, but can also be offered for retrofit.

The new high-density version of the Armonia cabin for the ATR 72-600 has also been unveiled, capable of accommodating 78 instead of 74 passengers. It is expected to receive certification before the end of this year, for service entry in 2016 with launch customer Cebu Pacific Air. PNG Air of Papua New Guinea is the launch customer for a new combi cabin, providing space for up to 44 passengers and 19m<sup>3</sup> (670ft<sup>3</sup>) of cargo. First delivery took place on 5 November.

Airbus Group and Alenia Aermacchi, which each hold a 50% stake in ATR, have agreed to disagree over a proposed development of a new 90-seat-plus turboprop, which has, for now, been put on the back burner.

While Alenia has made it clear that it sees a requirement for a larger turboprop, Airbus has balked at the high development costs and is probably also concerned about the likely impact on its own jet line. ATR chief executive Patrick de Castelbajac is said to be pushing for a change in the joint venture's legal structure, which would give more freedom in investment decisions. ■



Zest Air was an MA60 operator



The 90-seat CRJ900 NextGen features GE CF34-8C5 engines and leading edge slats

Bombardier

## Bombardier CRJ family

**T**he Canadian manufacturer is reinvigorating its marketing efforts on its CRJ NextGen regional jets, having lost market share in recent years to rival Embraer.

It has already achieved a 5.5% improvement in fuel efficiency through enhancements including a cap on the tail bumper, closing a roughly 25mm (1in) gap between the tail and rudder, carbon brakes on the CRJ900 from the CRJ1000, and lighter-weight materials throughout the aircraft, but is committed to delivering a double-digit cut by 2020. This could be achieved through a further aerodynamic clean-up of the aircraft, which may include a reshaped wing on the CRJ1000 and a longer, reshaped wing on the CRJ900, to match that of the CRJ1000.

The addition of landing gear doors is another possibility. While engine replacement has been ruled out, incremental gains on fuel burn of the GE Aviation CF34 would provide further efficiencies, to add to the 1% improvement already achieved.

The CRJ NextGen programme has already provided considerable improvements over the CRJ700 and CRJ900 models first introduced in 1999, featuring the Rockwell Collins Pro Line IV integrated avionics suite with a six-screen

glass cockpit, enhanced winglets and low drag profile for better performance and lower fuel burn, resin transfer moulded composites for outboard flaps and ailerons, control-by-wire multi-function spoiler with roll assist, control-by-wire rudder (CRJ1000 only), and larger overhead bins, LED lighting and new window design.

Through technology insertions, the 14,500lb-thrust (64.5kN) CF34-8C5 turbofan can be interchanged between the CRJ700, CRJ900 and CRJ1000 models. Bombardier claims lower fuel burn and 9% lower maintenance cost which, it says, adds up to a 5-15% cash operating advantage over competing jets.

The CRJ700 NextGen and CRJ900 NextGen were introduced in 2008, and the CRJ1000 NextGen, a stretch of the CRJ900 for up to 100 passengers, entered service in December 2010. The CRJ700 is a 70-seat stretched derivative of the 50-seat CRJ100/200 models, of which more than 1,000 were sold before production ceased. Available in two basic variants – the CRJ700 Series 701 and Series 705, differing primarily in the permitted passenger seating – and there are three fuel/weight options for increased range – standard, extended range, and long range.

The CRJ900 was yet another stretch – to 90 passengers, with CF34-8C5 engines giving a 5% increase in thrust, and leading edge slats. The CRJ1000, previously known as the CRJ900X, provides a further increase in seating capacity, to 100. ■

### DATA CHECK (TO 30 SEPTEMBER)

	CRJ100/200/440	CRJ700	CRJ900	CRJ1000
<b>First flight</b>	10/05/1991	27/05/1999	21/02/2001	03/09/2008
<b>Net orders (total/2015)</b>	1,021/0	345/0	391/7	68/-2
<b>Deliveries (total/2015)</b>	1,021/0	335/2	359/32	40/1
<b>Backlog</b>	0	10	32	28

### SPEC CHECK

	CRJ200	CRJ700	CRJ900	CRJ1000
<b>MTOW (t)</b>	21.5	38.1	37.5	41.7
<b>Seats (single-class)</b>	50	70	86	100
<b>Range (km)</b>	2,275	3,410	3,340	2,840

and leasing companies. Apart from launch customers Okay Airways and Joy Air, revealed at the Zhuhai air show in November 2014, other airline operators which intend to order the turboprop are from Cambodia, Nepal, Pakistan and South Africa. Leasing firms with commitments included CDB Leasing, CMB Leasing, and an undisclosed lessor from Chongqing.

Xian Aircraft is targeting the domestic and Asian market, as well as Africa and South America. Shrink and stretch versions may be introduced from 2020. ■



The updated turboprop has PW150A engines and an advanced Thales avionics suite

## Bombardier Q400

**W**hile orders for the Q400 NextGen continue to trickle in, Bombardier is placing greater emphasis on marketing, which it has admitted to having let slide somewhat, with the result that it has lost out to ATR in Europe.

The decision by Russia not to proceed with in-country assembly of a minimum of 100 aircraft – a preliminary agreement for which had been signed in Moscow in 2013 – in favour of resurrecting the Ilyushin Il-114, has also prompted a re-assessment.

According to the Canadian manufacturer, the strategy is on flexibility of the aircraft. Already, a variant with a reduced seat pitch of 29in (74cm) and reconfiguration of the forward baggage compartment to provide an 78-seat interior, has been sold to Nok Air of Thailand, but an 86-seat, high-density variant is also available. Capacity could be further increased to 90 seats, if the seat pitch is further reduced to 28in, but this is likely to be acceptable only to the Southeast Asian market.

As early as 2007, Bombardier had started to investigate a 90-seat version, called the Q400X, to be achieved through the insertion of a fuselage plug, which the company says would be “technically very easy”. The 507shp (378kW) Pratt & Whitney Canada PW150A turboprops would have sufficient power to

manage the additional weight, but re-engining with a new technology power plant has not entirely been ruled out.

Orders for the Q400 in 2015 include a firm order for 13 aircraft and 10 options by Chorus Aviation for its subsidiary Jazz Air, the conversion of two options by Horizon Air, three firm and two options by Luxair, a single unit by lessor Palma Holding for lease to RwandAir, two from Air Côte d'Ivoire, and six converted options by WestJet Encore, the latter taking delivery of the 500th Q400 on 25 June.

The original Q400, a stretched 70-78 passenger version of the earlier Q300, entered service in 2000. The updated model, first delivered in June 2009, features an advanced avionics suite from Thales, with a centralised diagnostic system, five-screen LCD cockpit displays, the active noise and vibration system, and the PW150A turboprop with FADEC and six-bladed propellers providing lower fuel burn. The cabin was also updated.

In June 2014, Bombardier launched a cargo-passenger combi version of the Q400 Next-Gen. Offered in several configurations, the high-capacity version provides up to 3,700kg (8,150lb) of cargo capacity and up to 32.5m<sup>3</sup> (34,300ft<sup>3</sup>) in volume, and seating for 50 passengers at 32in seat pitch. Launch customer Ryuku Air Commuter will take five combi versions.

A total of 623 of the original Dash 8 Series 100, 200, and 300 were built before production ceased. The last aircraft was delivered to Air Nelson in May 2008. ■

### DATA CHECK (TO 30 SEPTEMBER)

	Q100/200/300	Q400/NextGen
First flight	20/06/1983	31/01/1998
Net orders (total/2015)	623/0	539/24
Deliveries (total/2015)	623/0	493/19
Backlog	0	46

### SPEC CHECK

	Q100/200/300	Q400/NextGen
MTOW (t)	16.5-19.5	29.3
Seats (single-class)	37-56	74
Range (km)	1,890	2,522

## Comac ARJ21

**S**ome six years after its first flight, certification of China's long-delayed ARJ21 regional jet from the Civil Aviation Administration of China (CAAC) was achieved on 30 December 2014. The US Federal Aviation Administration, which is shadowing the certification process, is expected to certify the aircraft no sooner than two years after CAAC. Comac began the approval process for a production licence in April and this should be completed before the end of 2015. Several aircraft are in final assembly in Shanghai and the first delivery is scheduled to be made to launch customer Chengdu Airlines on 28 November.

The ARJ21 features an all-new supercritical wing with a 25° sweepback and winglets, designed by the Antonov Design Bureau in Ukraine. It is powered by two rear-mounted GE Aviation CF34-10A turbofans with a take-off thrust of 17,100lb-thrust (75.9kN) in the -700 baseline variant and 18,500lb-thrust in

## Embraer E-Jet family

**T**he Brazilian manufacturer is on schedule for a first flight of the E2 generation of its successful E-Jets by the second half of 2016 and service entry in 2018. Certification will be achieved with seven flight-test aircraft, covering the three variants – E175-E2, E190-E2 and E195-E2 – all with high commonality. Embraer expects to begin deliveries of the E190-E2 in 2018, followed by the E195-E2 in 2017 and the E175-E2 in 2020. The E170 does not form part of the E2 programme, as the demand for the smaller aircraft is thought to be dwindling, and the E175-E2 will replace both the E170-E1 and E175-E1. However, the company may continue production of the current-generation E175-E1 alongside the E2, if the pilot-contract scope clause in the USA, which limits the maximum take-off weight of regional aircraft to 39,100kg (86,000lb), is not relaxed to permit the increased weight of the E2, which comes in at 44,650kg. Also, there is likely to be a production overlap of up to three years with all models, as production ramps up of the three E2 variants to meet demand. Meanwhile, the current-generation models are being upgraded.

The biggest change in the E2 is the design

the -900. Other major Western equipment and systems include the Honeywell fly-by-wire system and Rockwell Collins integrated avionics suite.

### VARIANTS

In addition to the basic and stretched models, the company is also intending to launch freighter and business jet variants. Chengdu Aircraft Industry group is responsible for the construction of the nose, Xian Aircraft the wings and fuselage, Shenyang Aircraft the empennage, with final assembly by the Shanghai Aircraft Manufacturing Corpora-

tion. During the Paris air show in June, Comac revealed a commitment for seven ARJ21-700 jets from Puren Group for start-up Puren Airlines. In March 2015, ICBC Leasing placed a firm order for 30 aircraft, which brought the total of firm orders to 156. The majority of orders and commitments are from second and third-tier Chinese airlines, with others from airlines in Laos, Myanmar, Indonesia and Congo. No commitments have been recorded for the stretched ARJ21-900, nor for the ARJ21F freighter, but two Chinese companies are intending to buy three ARJ21B business jets, expected to be available in 2016.



The Chinese airframer plans other variants

In its 2013-2032 market forecast, Comac expects 4,346 new regional aircraft deliveries over the next 20 years, the majority of which will have 70 seats or more, a category in which the ARJ21 competes. During this period, it also expects China's regional aircraft fleet to increase by over 5%, to 726. ■

### DATA CHECK

	ARJ21-700	ARJ21-900	ARJ21B	ARJ21F
First flight	28/11/2008	0	0	0
Net orders (total/2015)	161/37			0
Deliveries	0	0	0	0
Backlog	161	0	0	0

### SPEC CHECK

	ARJ21-700	ARJ21-700ER	ARJ21-900	ARJ21-900ER
MTOW (t)	40.5	43.5	43.6	47.2
Seats (two-class)	78	78	98	98
Range (km)	2,200	3,700	2,200	3,300

of a completely new shape and more efficient wing with raked tips and a 5m (16ft 5in) increase in wingspan, incorporating a high aspect ratio, smaller relative thickness, and other aerodynamic refinements. Together with the Pratt & Whitney PW1700 and PW1900 geared turbofans, these will deliver a claimed 16% reduction in fuel consumption for the E175 and E190, and 24% for the E195. The E175-E2 will be powered by the PW1700G with a thrust of 16,860lb (75kN), with higher thrust of 22,030lb being provided by the PW1900G fitted to the E190-E2 and E195-E2 variants. The E175-E2 will have an extra seat row for a maximum of 88 passengers, while the E195-E2 will gain three seat rows for up to 132 passengers. Seating capacity of the E190-E2 remains unchanged at up



Embraer

E1 production could continue for US carriers

to 106 seats. Other changes include a new flight-management system and synthetic vision, as well as fly-by-wire controls. The cabin has also been redesigned with larger windows and overhead bins, improved lighting, temperature control, electrical connectors, staggered business-class seat configura-

tion and a new cabin management system.

During the Paris air show in June, several new orders brought the backlog for the E2 to 267. Options and other commitments bring the total to close on 550. Latest firm orders are from US lessor Aircastle, which has made a commitment for 15 E190-E2 and 10 E195-E2 variants, with an additional 25 options across both. Earlier in the year, Brazilian airline Azul signed for 30 E195-E2, with purchase rights for an additional 20, while Tianjin Airlines of China ordered two E190-E2s. Meanwhile, the current E-Jets continue to generate orders, the latest of which include a contract for 10 firm plus 18 options from United Airlines for the E175, and eight firm orders from Alaska Airlines of the same variant for use by Sky West Airlines. Embraer has also sold 890 of the smaller ERJ regional jet family, launched at the Paris air show in 1989. It entered service in December 1996 and was produced in the three versions, the basic and most successful 50-seat ERJ145, and the smaller 37-seat ERJ135 and 44-seat ERJ140 variants. ■

### DATA CHECK (TO 30 SEPTEMBER)

	ERJ	E170	E175	E190	E195
First flight	11/08/1995	19/02/2002	14/06/2003	12/03/2004	07/12/2004
Net orders (total/2015)	890/0	188/0	564/43	661/19	255/60
Deliveries (total/2015)	890/0	188/0	311/62	518/3	141/3
Backlog	0	0	253	143	114

### SPEC CHECK

	E170*	E175*	E190*	E195*	E175-E2	E190-E2	E195-E2
MTOW (t)*	38.6	40.4	51.8	52.3	44.6	56.2	58.7
Seats (single-class)	72	78	100	116	88	106	132
Range (km)*	3,889	3,704	4,445	4,074	3,815	5,186	3,704

\*advanced range variant

# HAL/NAL RTA-70/90

This joint design and development programme by Hindustan Aeronautics (HAL) and National Aerospace Laboratories (NAL) for a twin-engined, 70-90 seat regional transport aircraft (RTA) has been in discussion for more than a decade. Approval in principle by the Indian government was given in mid-2013, with the company determined to implement the "Make in India" call by the prime minister. The design is apparently on the drawing board, but failure of the Kaveri engine is forcing HAL to seek an engine from a global manufacturer, although this is likely to be a turboprop. Previously published specification details and claims of 25% lower acquisition and operating costs and 50% lower maintenance costs than existing turboprop aircraft will have to be revised based on final engine choice. The request for information also refers to a larger 90-100 seat RTA-90. First flight is targeted for 2022, but previous prevarications and abandonment of indigenous projects in India do not instil confidence in the RTA getting off the drawing board. ■



Naga Osato Press Association Images

Maiden sortie for the MRJ90 took place on 11 November from Nagoya airfield in Japan

# Mitsubishi MRJ90

After several delays to the programme, the MRJ90 'MSN 10001' finally made its first flight on 11 November, with Mitsubishi Aircraft blaming a software bug during ground tests in the summer for the postponement

from the second quarter. According to the company, this slight delay will have no impact on the second quarter 2017 delivery schedule. The 2,500h of flight testing will start in the first or second quarter of 2016, with four of the five test aircraft to be based in the USA. Mitsubishi has opened a 3,700m<sup>2</sup> (131,000ft<sup>3</sup>) engineering centre at Seattle, and is building a 6,040m<sup>2</sup> hangar at Grant County International airport, where a large part of the test campaign will be con-

# Illyushin Il-114

The 64-seat Il-114-100 is a twin-engined turboprop airliner powered by two 2,750shp (12.3kN) Pratt & Whitney Canada PW127H engines and equipped with a modern TsPNK-114 Collins digital flight navigation suite, jointly developed by NII AO Federal State Unitary Enterprise and Rockwell Collins. First flown on 26 January 1999 and certificated in December that year, it replaced the earlier Klimov TV7-117S-powered model, which had made its maiden flight on 29

March 1990. The aircraft failed to make any inroads into the market and only 16 were sold before production was discontinued, but a few remain in revenue service with Uzbekistan Airways. As a result of EU sanctions on Russia following its annexation of Crimea and other attempts at destabilising Ukraine, Moscow is restarting production of the mothballed Il-114, preferring a "new" Il-114 over local production of Bombardier's Q400.

## RELIABILITY

The "new" Il-114 is to be powered by two TV7-117SM engines, which is offering lower fuel burn, but may still be inferior to the P&WC powerplants in terms of reliability and mean-time between overhaul. It is planned



Moscow will restart production of the Il-114

that it would replace the An-140 on the Aviacion assembly lines. Apart from producing an Il-114-300 passenger version, using only Russian-produced components, the -300 will also be built in an all-cargo configuration as the Il-114-300T, and as a ski-equipped variant for use in the Arctic. A development of the type is also being offered to the Russian navy as the

## DATA CHECK (TO 30 SEPTEMBER)

	Il-114	Il-114-100
First flight	29/03/1990	26/01/1999
Net orders (total/2015)		16/0
Deliveries (total/2015)		16/0
Backlog		0

## SPEC CHECK

	Il-114	Il-114-100
MTOW (t)	22.7	23.5
Seats (single-class)	64	64
Range (km)	1,000	1,400

ducted. Flight tests and engineering operations will also be undertaken at three more sites. These include high-altitude flight testing at Gunnison Crested Butte Regional airport in Colorado, special runway tests at Roswell International Air Center in New Mexico and extreme environment tests at McKinley Climatic Laboratory in Florida. The prospects for the new regional jets in the international market are still uncertain, with airlines appearing reluctant to place orders in light of the frequent delays to the programme. The only order placed in 2015 was a conversion of a letter of intent for 32 aircraft by Japan Airlines in January, bringing the total firm orders to 223 from six customers, all for the MRJ90. The company claims options for another 164 and LoI for 20. Launch customer is All Nippon Airways, but the largest customer is Sky West, with 100 aircraft on firm order, plus 100 options. A final assembly plant is under construction near Nagoya, Japan, which will be able to

produce up to 10 aircraft per month, when completed in mid-2016. It will be the sole production facility for the aircraft. Mitsubishi projects a requirement for 5,190 regional jets worldwide over the next 20 years, of which it hopes to capture half of the market with its jet family.

### FUEL CONSUMPTION

The MRJ is intended as a family of 70-90-seat aircraft featuring Rockwell Collins avionics, noise analysis technology, and the new Pratt & Whitney geared turbofan engine, all of which are claimed to contribute to a significant reduction in fuel consumption – stated to be more than 20% over current production regional jets – noise and emissions. It also boasts a wide cabin, slim seats, large overhead bins, and a toilet for passengers with reduced mobility. The first baseline model is the MRJ90, with a capacity of 92 passengers in a single-class, four-abreast arrangement, which is to be followed by the

shorter MRJ70, typically fitted out for 78 passengers, although no timeframe has been announced for this model. It is also intended to produce both models in extended range (ER) and long range (LR) variants. The company is also investigating the possibility of adding a 100-seat variant to the family, but this is very much dependent on airline demand and funding sources.

Mitsubishi Aircraft was founded in April 2008 with a capital of ¥100 billion (\$800 million). Principal shareholders are Mitsubishi Heavy Industries (64%), Mitsubishi Corporation (10%), Toyota (10%), Sumitomo (5%) and Mitsui & Co (5%). ■

### DATA CHECK (TO 30 SEPTEMBER)

	MRJ90
First flight	11/11/15
Net orders (total/2015)	223/32
Deliveries	0
Backlog	223

### SPEC CHECK

	MRJ70	MRJ70ER	MRJ70LR	MRJ90	MRJ90ER	MRJ90LR
MTOW (t)	36.8	39	40.2	39.6	41	42.8
Seats (single-class)	78	78	78	92	92	92
Range (km)	1,530	2,730	3,380	1,670	2,400	3,310



## NAC Fokker 120

Plans are still being made to resurrect production of the Fokker 100 twinjet, although no further progress has been reported. Netherlands Aircraft Company (NAC) is working on securing finance and supply chain partners to launch a new-build aircraft, dubbed the Fokker 120.

### WINGLETS

Designed for 125-130 passengers, the new aircraft would be a stretch of the basic Fokker 100, with a slightly longer wing with winglets and modified wing profile, and new 17,600lb-thrust (78kN) Pratt & Whitney geared turbofan engines. NAC claims the Fokker 120 will provide the lowest fuel burn and direct operating costs per seat, lowest CO<sub>2</sub> emissions and interior and exterior noise levels, while also offer-

The new type would be a stretch of the Fokker 100



Lex Layton/Imaginechina/Ree Shutterstock

ing 25% more seats with a similar engine to that used by the Embraer E175-E2 and Mitsubishi MRJ90. The Fokker 120 could enter service as early as 2019. Its main competitors would be the Bombardier CSeries and the Embraer E2 family. ■

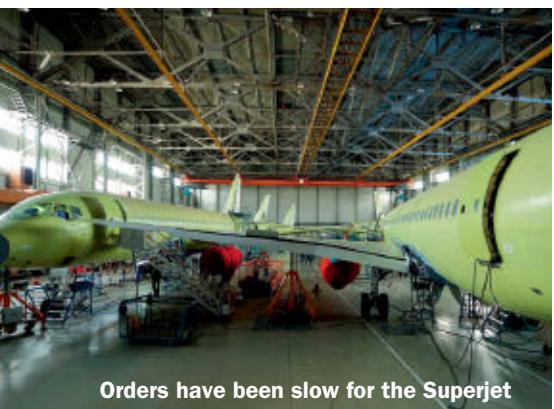
### SPEC CHECK

	120-Standard	120-Option 1	120-Option 2
MTOW (t)	46.7	47.6	48.3
Seats (single-class)	125-130	125-130	125-130
Range (km)	3,020	3,425	3,705

Il-114-300MP for maritime patrol/strike duties, fitted with a search radar, magnetic anomaly detector and thermal imager. It would be able to loiter for up to 10h carrying 1.5t of sonobuoys and depth charges. The first passenger aircraft could be available in 2018. Demand for the Il-114-300 is estimated at 320 units between 2019 and 2030. ■

# WORLD AIRLINER DIRECTORY

## SPECIAL REPORT



## Sukhoi Superjet 100

**S**ukhoi is concentrating efforts on the SSJ100-95 and -95LR variants, with which it has achieved success, mainly in its home market. It has abandoned plans for a smaller 60-seat version, and the 75-seat variant has also fallen out of favour, with the company focusing again on producing a family of regional aircraft, starting with a larger model, the Superjet SV, said to be in the preliminary research phase. This initial stretch to 115 passengers, designed to compete with Bombardier's new CSeries and the Comac C919, will have a more efficient wing and replace Western systems and avionics with Russian-built equipment but will retain the PowerJet SaM146 engines. Sukhoi has been studying the Pratt & Whitney

### DATA CHECK (TO 30 SEPTEMBER)

	SSJ100-95	SSJ100-95LR
First flight	19/05/2008	12/02/2013
Net orders (total/2015)	99/2	64/26
Deliveries (total/2015)	55/8	10/3
Backlog	44	54

### SPEC CHECK

	SSJ100-75*	SSJ100-75LR*	SSJ100-95	SSJ100-95LR
MTOW (t)	38.8	42.3	45.8	49.4
Seats (single-class standard)	78	78	98	98
Range (km)	2,900	4,550	3,048	4,578

\*Unlikely to be built

PW1000G geared turbofan, but has said its better fuel efficiency would be offset by the cheaper acquisition cost of the SaM146. The more efficient wing is expected to require only a minimal increase in thrust for heavier aircraft. This first stretched version could be in operation by 2022, and may be followed by the 130-seat capacity Superjet NG, intended to bridge the gap between the Superjet and larger Irkut MC-21. The NG would, however, require the higher thrust of the P&W geared engine.

### CITYJET BACKING

The Russian manufacturer had been struggling to secure a second order for a Western customer, having succeeded only in selling the Superjet to Mexico's Interjet, which added to its original order for 20 with 10 more this year. But in October Sukhoi had a boost when Irish regional airline CityJet signed an agreement for 15 aircraft plus 10 options, with first deliveries set for the first quarter of 2016. Apart from Russian airlines, the only other sales have been from carriers in Asia, which are being targeted through a Russian/Chinese

leasing company, which aims to build up a fleet of 100 aircraft over three years. A framework agreement is being set up between United Aircraft, New Century International Leasing of China, a Russian/Chinese investment fund, and the management committee of Xixian in Shaanxi province, where the new entity will be based. In November 2013, Sukhoi, Sberbank – Russia's largest bank – and Abu Dhabi Investment Co (InvestAD) signed a tri-lateral letter of intent for co-operation in marketing and promoting the aircraft in the Middle East and Africa, but this has yet to result in any orders.

In its 20-year (2015-2034) market outlook for regional aircraft (60-120 seats), Superjet International, the joint venture marketing and sales organisation formed by Sukhoi (49%) and Alenia Aermacchi (51%), projects deliveries of 1,900 aircraft in the 60-90 seat category, and 3,850 with 91-120 seats. North America and Europe will account for more than half of total deliveries. Other contracts signed in 2015 included another 20 aircraft for Aeroflot, to add to 30 previously ordered. ■

## TRJet 328/628

**T**RJet, a subsidiary of US-based Sierra Nevada Corporation, has signed a memorandum of understanding with the Turkish government for the development of a new 70-seat regional airliner in jet and turboprop versions with local manufacturer STM. Prospective partners include Turkish Aerospace Industries, Aselsan, TEI, Havelsan, Kale Aero, Alp Aviation, TSI and Turkish Airlines. The new aircraft – the TRJ628 and TR628 – will be made by STM in a factory at an undisclosed location, and are set to make their first flights in 2023. As in interim measure, Sierra Nevada intends to produce 50 aircraft based on the Dornier 328, whose type



Dornier 328 is the basis for first 50 aircraft

certificate it acquired in February via its purchase of 328 Group. An initial tentative commitment has been struck with the Turkish government. Modernisation of the 32-seat

328 will include new engines and a redesigned cockpit, and offer range gains. First flight is anticipated in 2019. The TRJ328 and T328 update types will be used by Turkish Airlines on regional operations, and will be offered for VIP, ambulance, maritime patrol, military cargo, and special-mission roles. Turkey will hold intellectual and industrial property rights to the aircraft.

TRJet has selected the 6,970lb-thrust (31kN) PW206B, which Pratt & Whitney Canada has agreed to modernise, for the Turkish jet, while a modernised PW119, or 2,500shp-class PW127 will power the turboprop. ■

### SPEC CHECK

	TRJ328	T328	TRJ628	TR628
MTOW (t)		15.6		
Seats (single-class)	32	32	70	70
Range (km)	3,720	1,850		

From yuckspeak to tales of yore, send your offcuts to murdo.morrison@flightglobal.com

## Long Short story of the Stirling

Thirty years is a long time to spend on a book – and many times longer than the in-service span of its subject.

Pino Lombardi's *Short Stirling: The First of the RAF Heavy Bombers* tells the story of the Royal Air Force's first four-engined heavy bomber, and is described by its publisher as a "labour of love".

Containing 400 mostly unpublished pictures and many interviews with those who built, maintained, and flew the aircraft, the book charts the history of the type from its design in 1936 to its entry into service in 1941 – after which it was rapidly superseded by the Handley Page Halifax and Avro Lancaster. It also covers its final days as a bomber in the hands of the Egyptian air force, and as a civilian transport after the war.

The £50 (\$85) price tag reflects the fact this is a detail-packed, multi-referenced tome that Lombardi has spent much of his adult life researching, but that probably makes it one for serious fans of Second World War bombers only.

## Strike that

On the subject of four-engined warplanes, we know the UK's military capabilities have been a bit patched together since the last Strategic Defence and Security Review, but we had no idea the humble BAe 146 is now one of our key strike assets.



BAe very afraid!



ANL/Rex Shutterstock

**"Hurry up lads, it'll be obsolete in a year's time."**  
**(RAF Bomber Command crews load a Short Stirling in 1941)**

Thanks to Tim Robinson of the Royal Aeronautical Society for this rather embarrassing spot from the Ministry's Twitter feed.

## Fight or flight?

**Pre Fight Information Bulletin (PIB)**  
3.1 NOTAM users are referred to the guidance on the NATS AIS website on how to generate PIB. Selecting a narrow route briefing or point reduce the number of NOTAM generated

John Russell found this cutting from a recent Civil Aviation Authority report about NOTAM changes. "Seems a novel way of avoiding conflict," he says.

## Feather-brained

As tensions between Moscow and Ankara worsened in recent days, a stateside colleague remarked on the irony of World War Three potentially breaking out on Thanksgiving because of Turkey.

## Food for thought

Rod Holdridge was impressed by reading in our Embraer Legacy 450 technical description (17-23 November) that the jet can boast

a stand-up cabin.

However, he points out that judging by the back cover advertisement for the aircraft in the same issue, there are certain disadvantages for travelling executives.

"The two punters at the rear of the cabin aren't going to be offered food," he says. "Meanwhile, the two at the front, it appears, will have to eat in the advertised standing position, while all diners are clearly expected to be left-handed knife wielders."



**"Who's not having dinner?"**

## Empty fears

Lecturing on Monday before the Medical Society of London,

**100 YEARS AGO** Dr. Leonard Hill said that owing to the enormous

ventilating power of the atmosphere there was no reason to fear that Zeppelins would drop poison bombs on London.

## Send your thermals

With the approach of winter there is an urgent demand for woollen garments for the fighting

**75 YEARS AGO** men of the R.A.F. The most

immediate need is for the airmen sent to Greece to support the offensive against the Italians. Thousands of woollen comforts are wanted for this theatre alone.

## Germany calling

A second RAF Lightning squadron will be transferred

**50 YEARS AGO** to Geilenkirchen at the end of this month. The

squadron is No 92, based at present at RAF Leconfield, Yorks, and equipped with the Lightning F.2 under the command of Wg Cdr J. A. Gilbert.

The squadron will replace the Javelins of 11 Sqn.

## Ranger recovered

The Australian Army has recovered a Bell 206 Jet

**25 YEARS AGO** Ranger seized by angry Papua New Guinea tribesmen and held to ransom. The Jet Ranger was seized after a village elder was killed when he walked into the tailrotor.

**FG 100-YEAR ARCHIVE** Every issue of Flight from 1909 onwards can be viewed online at [flightglobal.com/archive](http://flightglobal.com/archive)

# FLIGHT INTERNATIONAL

We welcome your letters on any aspect of the aerospace industry.

Please write to: The Editor, Flight International, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS, UK.  
Or email [flight.international@flightglobal.com](mailto:flight.international@flightglobal.com)

The opinions on this page do not necessarily represent those of the editor. Letters without a full postal address supplied may not be published. Letters may also be published on [flightglobal.com](http://flightglobal.com) and must be no longer than 250 words.

## No substitute for real experience

With reference to your article about learning lessons from the fatal Swiftair Boeing MD-83 crash in July 2014 (*Flight International*, 4-10 August), and to support the investigators' findings, I would like to relate what happened to me in 1996, as captain of an MD-83 flight carrying 169 passengers and six crew members from Paris, Orly to Tel Aviv.

During cruise, in clear sky, the auto-throttle retarded suddenly, in response to the engine pressure ratio (EPR) indicating a maximum and unreliable value (Ratio P7/P2 infinite, if denominator P2 at zero due to iced probe).

With the flight envelope now being narrow, within a few seconds speed decreased and the angle-of-attack increased above 10° and continued to increase, although I promptly disconnected the auto-throttle and pushed the throttles to restore power to a proper value – but which one?

With the EPR being unserviceable, what came to my mind

### MEASUREMENTS

## Lose "archaic" weight system

Your article "Data entry errors led to 737 tailstrike" (*Flight International*, 24-30 November) yet again raises my question regarding the take-off weights (well, masses to be precise) of aircraft, and the archaic methods used to estimate them.

As a chemist and also a teacher, I am truly aghast that in this day and age we can allow people's lives to be put at significant risk by such convoluted approaches to defining one of the key variables in successful flight.

When are we going to see some real technological development to actually measure an aircraft's mass before it is pushed back? Surely some sort of weight-sensing device built into undercarriages is the key. Why are we not seeing developments in this area?

It seems to me that almost every week – and this has been going on decade after decade – we get at least one report of some event which has incorrect mass input as a major cause.

How many will die before the issue is tackled – not by iPads or closer scrutiny to procedures, but by a fundamental rethink?

**Greg Herdman**

Retford, Nottinghamshire, UK

was the top of climb N1 value that I had memorised.

Threatened by the risk of stall at high altitude – commonly admitted as unsurvivable on an MD-83 – I was ready to dive at the first buffet alert, and have my co-pilot transmit an emergency call.

After the engine spool-up time, the angle-of-attack stabilised and slowly diminished, degree after degree, over very long minutes. This is how we found our way out of this trap.

MD-80 type-rating courses draw the attention of trainees to many of this aircraft's tricks, but not that one.

Providing an alternative means of setting the power in case of an unreliable EPR should



Qantas 737 incident highlighted problem

AirTeamImages

Anthony also mentioned that this depression will normally only come to light where a pilot feels able to voice initial symptoms within a "just culture" environment.

**Larry Heintz**

Ashford, Kent, UK

## Glaring gaps in spending review

A quick scan of the various interpretations of the UK government's spending review of 25 November raises a number of concerns and questions.

Firstly, it appears that everyone has missed the fact that there will be no replacement for HMS *Ocean* and that one of the Queen Elizabeth aircraft carriers will be "adapted" to stand in for her role.

Also, there is no mention of the ownership of the Lockheed Martin F-35 – Royal Air Force or Fleet Air Arm? Nor is there any timescale on maritime patrol.

I recognise that this is better news for the armed forces than they have had for years. It is all tempered, however, by a lack of people to man the kit.

**Steven Page**

via email

## Rocket shocker

The X-15, mentioned in the article about UK astronaut Tim Peake's mission to the International Space Station (*Flight International*, 24-30 November) was a product of North American, not Bell.

**John MacMaster**

via email



Rex Shutterstock

## EDITORIAL, ADVERTISING, PRODUCTION &amp; READER CONTACTS

**EDITORIAL +44 20 8652 3842**

**Quadrant House, The Quadrant,  
Sutton, Surrey, SM2 5AS, UK**  
[flight.international@flightglobal.com](mailto:flight.international@flightglobal.com)

**Editor** Craig Hoyle

+44 20 8652 3834 [craig.hoyle@flightglobal.com](mailto:craig.hoyle@flightglobal.com)

**Deputy Editor** Dominic Perry

+44 20 8652 3206 [dominic.perry@flightglobal.com](mailto:dominic.perry@flightglobal.com)

**Head of Strategic Content** Murdo Morrison FRAeS

+44 20 8652 4395 [murdo.morrison@flightglobal.com](mailto:murdo.morrison@flightglobal.com)

**Features Editor** Dan Thisdell

+44 20 8652 4491 [dan.thisdell@flightglobal.com](mailto:dan.thisdell@flightglobal.com)

**Business & General Aviation Editor** Kate Sarsfield

+44 20 8652 3885 [kate.sarsfield@flightglobal.com](mailto:kate.sarsfield@flightglobal.com)

**Aerospace and Defence Reporter** Beth Stevenson

+44 20 8652 4382 [beth.stevenson@flightglobal.com](mailto:beth.stevenson@flightglobal.com)

**Consulting Editor** David Learmount

+44 7785 901787 [david.learmount@ntworld.com](mailto:david.learmount@ntworld.com)

**Magazine Enquiries** Dawn Hartwell

+44 20 8652 3315 [dawn.hartwell@flightglobal.com](mailto:dawn.hartwell@flightglobal.com)

**AIR TRANSPORT TEAM****Editor Flightglobal Premium News** Graham Dunn

+44 20 8652 4995 [graham.dunn@flightglobal.com](mailto:graham.dunn@flightglobal.com)

**Managing Editor** Niall O'Keeffe

+44 20 8652 4007 [niall.okeeffe@flightglobal.com](mailto:niall.okeeffe@flightglobal.com)

**Air Transport Editor** David Kaminski-Morrow

+44 20 8652 3909 [david.kaminski-morrow@flightglobal.com](mailto:david.kaminski-morrow@flightglobal.com)

**Air Transport/MRO Reporter** Michael Gubisch

+44 20 8652 8747 [michael.gubisch@flightglobal.com](mailto:michael.gubisch@flightglobal.com)

**Senior Reporter** Oliver Clark

+44 20 8652 8534 [oliver.clark@flightglobal.com](mailto:oliver.clark@flightglobal.com)

**AMERICAS****Americas Managing Editor** Stephen Trimble

+1 703 836 8052 [stephen.trimble@flightglobal.com](mailto:stephen.trimble@flightglobal.com)

**Deputy Americas Editor – Air Transport** Ghim-Lay Yeo

+1 703 836 9474 [ghimlay.yeo@flightglobal.com](mailto:ghimlay.yeo@flightglobal.com)

**Air Transport Reporter** Edward Russell

+1 703 836 1897 [edward.russell@flightglobal.com](mailto:edward.russell@flightglobal.com)

**Air Transport Reporter** Jon Hemmerdinger

+1 703 836 3084 [jon.hemmerdinger@flightglobal.com](mailto:jon.hemmerdinger@flightglobal.com)

**Aviation Reporter** James Drew

+1 703 836 7442 [james.drew@flightglobal.com](mailto:james.drew@flightglobal.com)

**ASIA/PACIFIC****Asia Editor** Greg Waldron

+65 6780 4314 [greg.waldron@flightglobal.com](mailto:greg.waldron@flightglobal.com)

**Asia Air Transport Editor** Mavis Toh

+65 6780 4309 [mavis.toh@flightglobal.com](mailto:mavis.toh@flightglobal.com)

**Asia Finance Editor** Ellis Taylor

+65 6780 4307 [ellis.taylor@flightglobal.com](mailto:ellis.taylor@flightglobal.com)

**Reporter** Aaron Chong

+65 6780 4851 [aaron.chong@flightglobal.com](mailto:aaron.chong@flightglobal.com)

**EUROPE/MIDDLE EAST****Israel Correspondent** Arie Egozi**FLIGHTGLOBAL.COM****Editor** Stuart Clarke

+44 20 8652 3835 [stuart.clarke@flightglobal.com](mailto:stuart.clarke@flightglobal.com)

**Web co-ordinator** Rebecca Springate

+44 20 8652 4641 [rebecca.springate@flightglobal.com](mailto:rebecca.springate@flightglobal.com)

**EDITORIAL PRODUCTION****Head of Design & Production** Alexis Rendell**Global Chief Copy Editor** Lewis Harper**Chief Copy Editor, Europe** Dan Bloch**Layout Copy Editors** Max Hall, Sophia Huang,

Tim Norman

**Global Production Editor** Louise Murrell**Deputy Global Production Editor** Terence Burke**Deputy Digital Producer** Damion Diplock**Web Production Editor** Andrew Costerton**Senior Designer** Lauren Mills**Consulting Technical Artist** Tim Hall**DISPLAY ADVERTISEMENT SALES****Quadrant House, The Quadrant,  
Sutton, Surrey, SM2 5AS, UK****EUROPE****Global Sales Manager** Mark Hillier

+44 20 8652 8022 [mark.hillier@flightglobal.com](mailto:mark.hillier@flightglobal.com)

**Key Account Manager** Grace Hewitt

+44 20 8652 3469 [grace.hewitt@flightglobal.com](mailto:grace.hewitt@flightglobal.com)

**Sales Support** Gillian Cumming

+44 20 8652 8837 [gillian.cumming@rbi.co.uk](mailto:gillian.cumming@rbi.co.uk)

**NORTH & SOUTH AMERICA****Vice-President, North & South America**

Rob Hancock +1 703 836 7444

[robert.hancock@flightglobal.com](mailto:robert.hancock@flightglobal.com)

**Regional Sales Director**

Warren McEwan +1 703 836 3719

[warren.mcewan@flightglobal.com](mailto:warren.mcewan@flightglobal.com)

**Sales Executive** Kaye Woody

+1 703 836 7445 [kaye.woody@flightglobal.com](mailto:kaye.woody@flightglobal.com)

Reed Business Information, 333 N.Fairfax Street,

Suite 301, Alexandria, VA 22314, USA

# CLASSIFIED

**TEL** +44 (0) 20 8652 4897 **FAX** +44 (0) 20 8652 3779 **EMAIL** classified.services@rbi.co.uk  
Calls may be monitored for training purposes

## New and used aircraft



Fleet of five ERJ 145 LR's for sale,  
individually or as a package.

Manufactured 2004

'N' registered

Long range

Drop down air stair door

50 leather seats

Engine Thrust Reversers

Engines Rolls Royce TotalCare

Contact Patrick Leopold

patrick@skyworld.co.uk

Tel. + 44 1753 832088

[www.skyworld.co.uk](http://www.skyworld.co.uk)

The Regional Aircraft Marketing Specialist  
Tel. + 44 1753 832088 info@skyworld.co.uk

## Package of ERJ 145 LR's for sale



## Business services



## Courses and tuition





TIME FOR  
YOUR CAREER  
TO TAKE FLIGHT

Start your job search today  
[flightglobal.com/jobs](http://flightglobal.com/jobs)

AVIATION | AIRLINES | AEROSPACE

 Flightglobal  
Jobs

**Getting careers off the ground**

# flightglobal.com/jobs

**EMAIL** recruitment.services@rbi.co.uk **CALL** +44 (20) 8652 4900 **FAX** +44 (20) 8652 4877



Flightglobal Jobs

AVIATION CONNECTED



**JOTA** Aviation

To meet ongoing expansion  
Jota Aviation is recruiting  
for positions on their  
Avro RJ/BAe 146 fleet

- Line Training Captains
- Captains
- First Officers

Based in the South-East of England.

Candidates must be experienced in the role applied for and hold an EASA or JAR licence with a current Avro RJ/BAe 146 type rating

Also Recruiting For:

- Operations Supervisors
- Operations Controllers

Competitive remuneration packages are offered

Apply By Email [recruitment@jotaaviation.com](mailto:recruitment@jotaaviation.com)



**STATES OF GUERNSEY**

Guernsey Airport, Public Services Department

## Air Traffic Control Officer

ID 16761

The Public Services Department of the States of Guernsey is seeking a qualified Air Traffic Control Officer to provide ADI and APS services at Guernsey Airport.

Candidates will hold a valid ATCO Licence issued in accordance with Commission Regulation (EU) No. 805/2011 together with valid ADI and APS Rating and Unit Licence Endorsements, and a current EASA Class 3 Medical Certificate. An OJTI or Examiner Endorsement would be an advantage.

ATC at Guernsey Airport provides ADI and APS services in Class D airspace to a varied mix of traffic ranging from microlights to short haul airliners. An APS service is provided to Alderney Airport. A major airport rehabilitation project has recently been completed, and our new Thales PSR/Mode S MSSR radar is now operational. RNAV approaches are in frequent use at both islands.

Salary: up to £83,422 pa plus a shift allowance payment of £6,216 pa. A relocation package will also be offered.

Contact: Mr Frank McMeiken, Manager Air Traffic Control, Guernsey Airport on 01481 234950 or email: [frank.mcmeiken@gov.gg](mailto:frank.mcmeiken@gov.gg)

Please apply online at [www.gov.gg/careers](http://www.gov.gg/careers). The eRecruitment team can be contacted at: [eRecruitment@gov.gg](mailto:eRecruitment@gov.gg) or tel: 01481 747394.

Closing Date: 20 December 2015

**aviation resourcing services**

specialists in aviation mro and production recruitment

- maintenance personnel • production personnel
- temporary and permanent • global reach

[flight@resourcegroup.co.uk](mailto:flight@resourcegroup.co.uk)  
[www.resourcegroup.co.uk/ars](http://www.resourcegroup.co.uk/ars)

**+44 (0) 1638 672 880**

**resource**  
group

**TIME FOR  
YOUR CAREER  
TO TAKE FLIGHT**

**Start your job search today**  
**[flightglobal.com/jobs](http://flightglobal.com/jobs)**

Flightglobal  
Jobs

# Birmingham Airport Air Traffic

Birmingham Airport, the UK's 7th busiest Airport, is located 5.5 nm ESE of the City of Birmingham and alongside the National Exhibition Centre.

Birmingham Airport has recently taken the provision of Air Traffic Services in house. In accordance with Birmingham Airport Air Traffic Ltd (BAATL) ANSP Policy Statement 'to provide the highest level of safety in its air navigation services and whenever practicable improve the safety of those services' BAATL will be looking for a highly safety-focused individual who will maintain the current high standard of service delivery.

BAATL would therefore like to invite applications for the following post:

## Manager Air Traffic Services -

The successful candidate will, as part of the air traffic management team, be accountable to the Head of Air Navigation Services for the provision of safe and expeditious ATC and Met services at Birmingham Airport.

They should hold a European ATCO Licence with currently validated ratings in ADI and APS. In addition, a Met Observers Certificate and OJTI endorsement are also essential. An EXM endorsement is desirable.

Air Navigation Services are provided in accordance with all statutory/regulatory requirements and the BAATL Integrated Management System. A comprehensive knowledge of Safety, Quality and Security Management systems is essential. The successful candidate will have recent management experience within the ATC environment, in an administrative, operational or training role. A competitive remuneration & relocation package is on offer.

Suitably qualified candidates should submit a covering letter and CV to [recruitment@birminghamairport.co.uk](mailto:recruitment@birminghamairport.co.uk). Any queries should also be directed to this address.

**The closing date for applications will be Monday 21st December 2015**

Interviews will take place on  
Tuesday 5th and Thursday 7th January 2016.



**CATHAY PACIFIC**

**Title: Operations Training Specialist (contract)**

**Department: Flight Operations**

**Reports to: Technical Training Manager**

Cathay Pacific Flight Operations Technical Training School (TTS) based in Hong Kong, provides training to the highest standards for both Cathay Pacific Flight Crew and Cathay Pacific Line Maintenance Engineers. TTS holds both HKAR 147 and EASA 147 type rating approvals.

We are seeking Airframe/Engine Technical Instructors with a keen commitment to providing training to the highest standards.

### Responsibilities:

As an Instructor you will be part of a team of instructors that provides Classroom and Fixed Base Simulator Training for Flight Crew and Classroom and Practical Training for Line Maintenance Engineers. Being an integral part of the instructional expertise within TTS, you will also assist in developing and maintaining these essential training programmes to the standards required by the Hong Kong CAD and EASA.

### Requirements:

- Excellent English language communication and presentation skills are a must.
- Must be able to demonstrate knowledge of aircraft systems and maintenance practices.
- Experienced with Windows based presentation and word applications.
- Formal instructor qualification or other recognised instructional training and experience is highly desirable.
- Part-66 B.1 (or equivalent) Aircraft Maintenance Licence is desirable but not a pre-requisite.
- 3-5 years work experience (Line and/or Base maintenance) on wide bodied commercial aircraft like the B777 and A330 is desirable but not a pre-requisite.
- Candidates with no instructing experience may be considered as Technical Instructor Trainee.

<https://career10.successfactors.com/career?company=CPA>



## Be a Captain in the heart of Southeast Asia

### Applications invited for A320 Captain positions

- A320 Rated and Non Rated opportunities available.
- Generous tax-free remuneration and leave package.
- Peaceful, family friendly and low-cost living environment.

For application details  
visit [www.flyroyalbrunei.com/careers](http://www.flyroyalbrunei.com/careers)



[WWW.FLYROYALBRUNELCOM](http://WWW.FLYROYALBRUNELCOM)

ROYAL BRUNEI AIRLINES ROYAL BRUNEI AIRLINES ROYAL BRUNEI AIRLINES



BIMAN HEAD OFFICE, 'BALAKA' - KURMITOLA, DHAKA 1229, BANGLADESH, CABLE: AIRBANGLA  
TELEX: 642649 DABG BJ, PHONE: 8917400-19, 8912390-07, FAX: 88-02-8913005

Ref: DACGO/Recruitment/2015/428

Date: 23-11-2015

### Vacancy Announcement for Managing Director & CEO

Biman Bangladesh Airlines Limited invites applications from deserving Bangladeshi and foreign nationals for appointment as Managing Director & Chief Executive Officer of the Airline. The position demands the following requirements:

- a. **Age Limit:** 45-60 years (relaxable for exceptionally deserving candidates)
- b. **Knowledge & Work Experience:**
  - Minimum 20 years' experience in Aviation, including 10 years in a senior management or Directorial position.
  - Detailed knowledge of airline marketing, including codeshares, new online distribution technologies, and Revenue Management Systems.
  - Knowledge of Aviation and Labour Law.
  - Demonstrated and hands-on skills in managing a variety of projects.
  - Ability to deal and negotiate with other airlines, airline service providers, financial institutions, aircraft owners/lessors, regulators etc.
  - Should have some understanding of the challenges and opportunities of working on the Subcontinent/Region.
- c. In addition to the above, the applicant should i) demonstrate the ability to coach/guide/mentor the leadership team to achieve an ambitious growth plan ii) should have proven interpersonal skills, linked with cultural understanding iii) should have the ability to help solve a wide variety of operational and other problems iv) should have the vision and leadership, for the enhancement and implementation of company strategy.
- d. **Salary:** Negotiable (candidates are encouraged to mention salary expectation)
- e. Only short-listed candidates will be called for interview.
- f. For more information on Biman, please visit our website [www.biman-airlines.com](http://www.biman-airlines.com)
- g. Interested candidates are requested to send their applications along with a complete CV and photograph by **22 December 2015** to **mgtrepmp@bdbiman.com** or the following address:  
Dy. General Manager(Human Resources)  
Biman Bangladesh Airlines Ltd  
'BALAKA', Kurmitola, Dhaka-1229

**Flight crew**

Flight  
Crew  
Services



- Commercial & VIP Recruitment
  - Management Recruitment
  - Temporary & Permanent
  - Payroll
- flight@resourcegroup.co.uk  
+44 (0) 1256 368 500  
www.resourcegroup.co.uk/fcs

**RECRUITMENT FOR THE AVIATION INDUSTRY**


AVIATION SERVICES  
Tel: +353 1 669 8224  
Fax: +353 1 669 8201

Email: recruitment@sigmaaviationservices.com  
www.sigmaaviationservices.com

**Flight crew**

Talk to us for the most exciting  
Expat Pilot Jobs in INDIA

jobs@proctoraviation.com  
www.proctoraviation.com  
+91 22 6120 4400

**Technical  
Recruitment  
Solutions**


- Product & System Design
  - Project Management
  - Manufacturing & Supply Chain
  - Engineering & Engineering Management
- trs@resourcegroup.co.uk  
+44 (0) 1905 368 576  
www.resourcegroup.co.uk/trs

**Maintenance**
**AeroProfessional**

Aviation People Experts

- Recruitment
- Skills Insights
- Compliance
- Flight Ops Support

[www.aeroprofessional.com](http://www.aeroprofessional.com)

**Maintenance**

Aviation  
Resourcing  
Services



- Maintenance Personnel
  - Production Personnel
  - Temporary & Permanent
  - Global Reach
- flight@resourcegroup.co.uk  
+44 (0) 1638 672 880  
www.resourcegroup.co.uk/ars

**Engineering**

The preferred company for Stress (Fatigue & DT), GFEM, Composites), Aeronautical Research. Business units: Contract staff, Workpackages, Innovation and New Concepts, Aeronautical Research. [www.bishop-gmbh.com](http://www.bishop-gmbh.com)  
Contact [bishop.peter@bishop-gmbh.com](mailto:bishop.peter@bishop-gmbh.com)  
Tel 0049-(0)40-866-258-10 Fax 0049-(0)40-866-258-20

TIME FOR  
YOUR CAREER  
TO TAKE FLIGHT

**Engineering**
**Strongfield  
Specialist Aerospace  
Personnel**


+44 (0)20 8799 8924 [amedhurst@strongfieldtech.com](mailto:amedhurst@strongfieldtech.com)  
[www.strongfieldtech.com](http://www.strongfieldtech.com)

**GDC**

ENGINEERING  
Worldwide specialist for  
Aerospace Engineering, Certification &  
Management Services  
E: [yourcv@gdcengineering.com](mailto:yourcv@gdcengineering.com)  
T: +49 (0) 8153 93130  
W: [www.gdcengineering.com](http://www.gdcengineering.com)

Start your job search today  
[flightglobal.com/jobs](http://flightglobal.com/jobs)



# Let your recruitment drive soar...

AVIATION | AIRLINES | AEROSPACE

post your vacancies now  
[recruiters.flightglobal.com](http://recruiters.flightglobal.com)



"Finding the right candidate at the right time can be a major challenge, but Flightglobal Jobs is a really useful channel to reach the best of the aviation talent pool."

European Business Aviation Association (EBAA)



## WORK EXPERIENCE ALEX BENNETT

# Keeping ahead of volatile markets

After acquiring a fascination for aviation as a young visitor to the Farnborough air show, Alex Bennett is benefiting the industry with his currency expertise at a time when Forex trades are very much headline news

## How did you become involved in aviation?

Having had a personal interest in aviation since an early age – my father and I used to visit the Farnborough air show, which I always loved – I had some insight into the wider context of the industry. This made me realise what a specialist industry it is. I started to work with Smart Currency Business 10 years ago and began developing a client business within aviation. This has grown organically, into its own dedicated part of the company.

## What does your working week consist of?

My week is a real mixture of activities, which includes visiting clients to ensure they are satisfied with the services provided, conducting internal meetings to look at how we can better serve our client base, working on strategies with clients, researching markets to make sure we are on top of all the variables that may affect currency transactions, and attending networking events to ensure that we are up to speed with industry issues. I also work on Insights: Aviation Business; a marketing tool that is a key part of the Smart Currency Business Insights series and includes features and commentary from industry leaders. I'll get involved suggesting editorial themes and working with the marketing team to raise our profile.

## How does what you do support aviation companies?



Smart Currency Business

## In for a penny, in for a pound: global firms have to watch the bottom line

For any business operating on an international scale, mismanagement of currency transactions can have a serious effect on the bottom line. As aviation companies trade worldwide, many deals involve not one but a number of currencies all tied to the whims of the dollar. It is essential, therefore, aviation businesses are aware of the anomalies of the currency exchange system and how best to minimise their exposure. This is where Smart Currency Business comes in: we aim to support their currency exchange transactions to make sure that they don't lose out.

## What are the challenges you see for aviation in terms of currency exchange?

It is undoubtedly a turbulent

time for the international currency markets. A series of factors have affected stability, like tumbling oil prices (now at their lowest in years), which is particularly significant for the aviation industry; geopolitical risk; uncertainty about interest rate hikes in the US and UK; and the ambiguity surrounding the European Central Bank's potential quantitative easing programme. These have seriously affected stability so we try to help minimise the risks on behalf of our clients. If companies don't take these factors into consideration, they face losing money on the bottom line, which is something we want to help them avoid.

## What aspects do you enjoy about your role?

It's been exciting to develop the Smart Currency Business aviation wing, and to see it continuously soar to new heights. I enjoy working with people from companies that are professional and passionate about the sector. I've had the pleasure of meeting and learning from prominent figures from the industry, which has been invaluable.

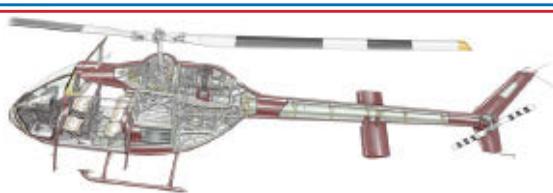
## What do you think the future has in store for aviation currency exchange?

The one thing we are certain of is the currency markets will continue to be unpredictable, and, given the speed and volume of transactions in the aviation industry, it's imperative businesses have the right strategies to mitigate risk. We also believe currency exchange can be dependent on industry regulations, so it is important the industry keeps up to date with the latest situation. If you combine these, it seems the future of aviation currency exchange is challenging, but we'll continue to develop strategies for managing the fluctuating situation and supporting our clients' need to ease the impact of these external forces. ■



Looking for a job in aerospace?  
Check out our listings online at  
[flightglobal.com/jobs](http://flightglobal.com/jobs)

If you would like to feature in Working Week, or you know someone who does, email your pitch to [kate.sarsfield@flightglobal.com](mailto:kate.sarsfield@flightglobal.com)



## Check out Flight International's Image Store

Browse or customise a gift or memento from our  
**CUTAWAY ARCHIVE** of more than 1000 aircraft drawings

[www.flightglobalimages.com](http://www.flightglobalimages.com)

Flightglobal  
AVIATION CONNECTED



## Ingenuity in Flight.

### C Series

Radical improvements require radical innovation. That's why, in our efforts to make the world's leanest, most economical aircraft, we didn't just tweak – we reinvented. Every element of the C Series is custom-designed and purpose-built, resulting in a jet fleet that offers a 15% cash operating cost advantage, a peerless environmental scorecard and transcontinental range. If you want the most efficient aircraft in the skies, opt for the one that's been built from the ground up.

**BOMBARDIER**  
the evolution of mobility